Investor Risk Tolerance: Testing The Efficacy Of Demographics As Differentiating And Classifying Factors

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This study was designed to determine what variables would differentiate between levels of investor risk tolerance and classify individuals into risk tolerance categories. A model was developed and empirically tested using data from the 1992 Survey of Consumer Finances. Multiple discriminant analysis indicated that the educational level of respondents was the most significant differentiating and classifying factor. Gender, self-employment status, and income also were found to be effective in discriminating among levels of risk tolerance. Demographic characteristic provide only a starting point in accessing investor risk tolerance. More research is needed to explain variations in risk tolerance.

Key Words: *Demographics, Risk tolerance, Survey of Consumer Finances*

In recent years, investment managers[a] and researchers have taken a renewed interest in understanding investor risk tolerance. Much of this interest has coincided with advances in the conceptualization of investment management models. Modern investment management decision making models require investment managers to use, at a minimum, four factors as inputs into the development of financial and investment plans. These inputs include an investor's: (a) goals, (b) time horizon, (c) financial stability, and (d) risk tolerance (Garman & Forgue, 1997; Hallman & Rosenbloom, 1987; Trone, Allbright & Taylor, 1996).

The first three inputs (i.e., goals, time horizon, and financial stability) tend to be objective and relatively easy to measure. Investor goals include plans to use investment principal and earnings for purposes such as educational expenses, retirement, future gifts, and estate transfers. Time horizon refers to the anticipated time span the investor will need before beginning to use investment returns; financial stability refers to concepts such as the nature and stability of an investor's employment, assets, liabilities, and net worth, and the extent to which current income is needed for current living expenses. The fourth input, investor risk tolerance, refers to how well an investor is able "to weather the ups and particularly the downs in the securities markets ... with an emphasis on an investor's attitudes and emotional tolerance for risk" (Hallman & Rosenbloom, 1987, p. 169). Unlike the other inputs into the investment management decision making process, investor risk tolerance tends to be subjective rather than objective, and somewhat difficult to measure.[c] Although difficult to measure, Trone et al. (1996) have suggested that an ability to achieve desired investment objectives is influenced most significantly by an investor's emotional ability to accept possible losses in portfolio value.

Due to the subjective nature of investor risk tolerance, sometimes investment managers "give only lip service to analyzing one's level of financial risk tolerance" (Roszkowski, 1995, p. RT 1). According to Roszkowski, Snelbecker, and Leimberg (1993), analyzing an investor's risk tolerance has tended to be based on demographics, which have been turned into risk predicting heuristics.[b] The following heuristics, based entirely on demographics, continue to be widely used to separate people into high, average, and no risk-tolerance categories (Roszkowski et al.):

A. Females are less risk tolerant than males;
B. Risk tolerance decreases with age;
C. Unmarried individuals are more risk tolerant than are married individuals;

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D. Individuals employed in professional occupations tend to be more risk tolerance than those in non-professional occupations;
E. Self-employed individuals are more risk tolerant than those employed by others;
F. Risk tolerance increases with income;
G. Whites are more risk tolerant than non-Whites; and
H. Risk tolerance increases with education.

Investment managers have a fiduciary responsibility to take into account investor risk tolerance when developing investment strategies and plans (Garman & Forgue, 1997; Hallman & Rosenbloom, 1987; Trone et al., 1996). There is general consensus among investment managers that demographics can be used to adequately classify clients into investor risk-tolerance categories. This consensus is alarming, because there is evidence to suggest that relying primarily on demographics to classify investors into risk-tolerance categories may cause investment managers to create and implement investment management plans that ultimately fail to match a client's investment objectives (Heisler, 1994; Palsson, 1996; Trone et al.).

Age, the most widely used demographic factor for differentiation and classification purposes, provides a good example of this potential problem. Investment managers assume that age and risk tolerance are inversely related. Thus, older investors are usually classified as tolerating only low levels of investment risk, while younger investors are assumed to prefer higher levels of investment risk. This classification strategy is costly in two respects. First, there is a chance that clients will be classified incorrectly, which can lead to extreme portfolio allocations for those clients. Second, this classification system may ultimately lead to what Palsson (1996) called a dispersion in wealth and welfare, because clients who are mis-classified may (a) sell at a loss if incorrectly classified into a higher risk-tolerance category, or (b) fail to meet goals and objectives if wrongly classified into a lower risk-tolerance category. In either case, the fiduciary credibility of an investment manager may be questioned.

It appears that Palsson's (1996) assertions are supported by investment manager performance. According to Train (1995), the average mutual fund returned 12.5% a year for the five year period ending in mid-1994, but the actual returns obtained by investors in these same funds was negative 2.2%. Quinn (1997) reported a similar finding. She reported that investors who owned equity mutual funds earned, on average, 10% less than the funds themselves in each of the 12 years from 1984 to 1996. These results indicate that investors purchased shares when prices were rising, and sold shares when prices were falling.

Poor investment performance on the part of investment managers suggests that managers may not be measuring investor risk tolerance accurately, and that investment managers may be relying on demographic classification factors that have limited or no differentiating efficacy. Findings reported by Train (1995) and Quinn (1997) also suggest that investment managers may be relying on demographics to classify individuals into investor risk-tolerance categories because they lack the tools, both models and heuristics, to accurately classify investors into risk-tolerance categories (Elvekrog, 1996). Regardless of the reasons, it appears that some investment managers systematically fail to choose investments that match underlying investor risk tolerances, which often results in costly losses[d] (MacCrimmon & Wehrung, 1986; Palsson, 1996; Roszkowski, et al., 1993; Train).

The purpose of this study was to determine whether the variables gender, age, marital status, occupation, self-employment, income, race, and education could be used individually or in combination to both differentiate among levels of investor risk tolerance and classify individuals into risk-tolerance categories. Conclusions and recommendations based on findings from this research were developed to (a) provide insights into which of the eight categories of demographics were most significant in differentiating among and classifying someone into investor risk-tolerance categories; (b) go beyond purely subjective criteria related to the personal characteristics of individuals in order to define a set of operating characteristics that distinguished among high, average, and no investor risk tolerance; and (c) consider the implications of those demographics that did not distinguish among high, average, and no investor risk tolerance.

It was anticipated that this research would be useful to investment managers in three specific ways. First, this research would add a measure of objectivity to a decision making process which has tended to rely on a combination of art, intuition, and experience in arriving at an estimate of investor risk tolerance. Second, this study would contribute to the general knowledge in the field of family financial management by providing a

multivariate analysis of the risk-tolerance variable using the levels of response provided in the 1992 Survey of Consumer Finances (Sung & Hanna, 1996b); and third, this research would contribute to the ongoing discussion regarding the efficacy of using demographics to differentiate among and classify investors into different risk-tolerance categories.

Conceptual Background and Framework

Investment managers are concerned primarily with a client's access to and allocation of investment and financial resources. The role of an investment manager is to help establish a client's financial objectives, develop plans, and manage how resources are accessed and allocated to meet objectives. The investment manager's administrative role can be defined as managerial activities and processes for using resources to meet desired financial goals and purposes (Leimberg, Satinsky, LeClair & Doyle, 1993).

Leimberg et al. (1993) were among the first to conceptualize the financial planning and investment decision making process. they recommended using the framework as a working tool to help investment managers summarize the following individual activities involved in the process of investment and financial planning: (a) gathering background information, (b) establishing financial objectives, (c) developing financial plans, (d) controlling and executing plans, and (e) measuring performance. The framework is useful as a working theoretical model because it is holistic, giving equal weight to inputs, management processes, and outputs. outputs are measured in terms of client satisfaction, which is defined as achieved ends in comparison with initial goals. it is recursive to allow for the cyclical nature of the planning, implementation, and performance evaluation processes. In sum, the model shares similarities with the deacon and Firebaugh (1988) theory which is often applied to the study of financial management.

The model also offers researchers a theoretical view of how investment managers use background analysis information and objectives as inputs into the development of financial and investment plans, and how a process-centered management orientation leads to attained objectives. according to Leimberg et al. (1993), a necessary and "important area of background analysis has to do with attitudes toward the degree of risk someone is willing to accept in a financial plan. feelings about investment risk, personal financial security, and independence are just as important as income statements or net worth" (p. 23). investment managers who are aware of their clients' risk tolerance are best able to establish realistic and acceptable objectives. Leimberg et al. warned that investment managers who ignore risk tolerance are unlikely to implement plans or meet objectives.

In this research, emphasis was given to the role that gender, age, marital status, occupation, self-employment, income, race, and education play in differentiating among risk attitudes (investor risk tolerance) within the background analysis stage of the framework. The hypothesized classification relationships among gender, age, marital status, occupation, self-employment, income, race, and education to investor risk tolerance, as originally outlined by Leimberg et al. (1993) and others (e.g., MacCrimmon & Wehrung, 1985) are shown in the modified empirical model in Figure 1.

The empirical model clarifies the role played by certain demographics in classifying individuals into investor risk-tolerance categories. The demographics are shown to have a direct classification and differentiation effect on investor risk tolerance. This representation is important, because it indicates that the establishment of objectives and investment plans is not entirely an intuitive mechanism (Sharpe & Winter, 1991), but rather, investment managers do employ both quantitative and qualitative inputs prior to establishing, implementing, and controlling financial and investment planning functions. Furthermore, as shown in the empirical model, the estimation of someone's investor risk tolerance, on the basis of objective and subjective information, must precede the establishment of financial objectives and development of plans.

Background Review

In this research, investor risk tolerance (the dependent variable) referred to the maximum amount of investment risk someone was comfortable taking (Schaefer, 1978). Risk tolerance induces an order relation on risk evaluation. Schaefer described the relation this way: "two persons may very well agree on the riskiness of a set of gambles, but may nevertheless prefer different gambles, rank-ordering them differently according to their personal tolerance. This is not to say that people should agree on riskiness of options" (p. 17).

In general, one can expect individuals with a low risk tolerance to act differently with regard to risk than individuals with a high risk tolerance. Someone with a high level of risk tolerance would be expected to "accept a higher exposure to risk in the sense of taking sole responsibility, acting with less information, and requiring less control than would" someone with a low level of risk tolerance (MacCrimmon & Wehrung, 1986, p. 34). Individuals with low levels of risk tolerance generally: (a) require lower chances of a loss, (b) choose not to operate in unfamiliar situations, (c) tolerate less uncertainty, and (d) require more information about the performance of an investment (MacCrimmon & Wehrung). In summary, high risk-tolerance individuals accept volatile events, while low risk-tolerance individuals require certainty.

The following demographic definitions are provided in order to clarify why these characteristics continue to be considered by many investment managers and some researchers to be effective in differentiating among levels of investor risk tolerance, and why they were used as components within the background analysis stage in the empirical model.

Gender

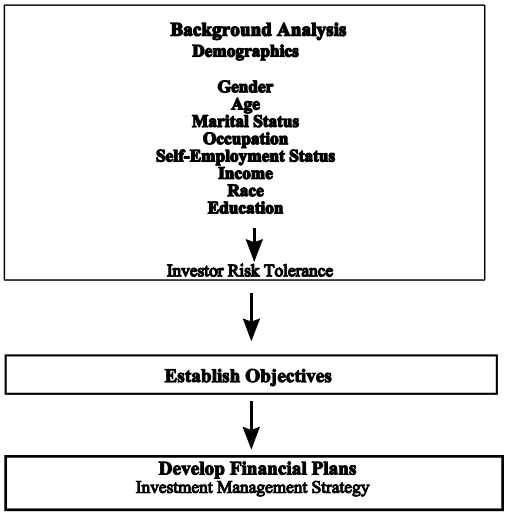
Gender (i.e., male or female) was considered an important investor risk-tolerance classification factor because more men than women tend to fit the personality trait called "thrill seeker" or "sensation seeker" (Roszkowski et al., 1993). There also is a "prevalent belief in our culture that men should, and do, take greater risks than women" (Slovic, 1966, p. 169), which has generated a strongly held view supported by research that gender is an effective differentiating and classifying factor (Bajtelsmit & Bernasek, 1996; Bajtelsmit & VanDerhei, 1997; Blume, 1978; Coet & McDermott, 1979; Hawley & Fujii, 1993-1994; Higbee & Lafferty, 1972; Hinz, McCarthy, & Turner, 1997; Rubin & Paul, 1979; Sung & Hanna, 1996b; Xiao & Noring, 1994).

Age

Investment managers use this input as a measure of the time remaining until a client's financial assets are needed to meet goals and objectives. In addition to being used as a proxy for time, investment managers also use age as a measure of someone's ability to recoup financial losses. It is widely assumed that older individuals have less time to recover losses than do younger individuals, and as such, risk tolerance will decrease with age.

Wallach and Kogan (1961) were perhaps the first to study the relationship between risk tolerance and age. Their experimental research with choice dilemmas indicated that older individuals were less risk tolerant than younger individuals. This finding created an increased interest on this topic, leading to two decades of research projects using choice-dilemma methods (e.g., Botwinick, 1966; Vroom & Pahl, 1971) as well as survey, experimental, and objective measure designs (e.g., Baker & Haslem, 1974; Bossons, 1973; Lease, Lewellen & Schlarbaum, 1974; Okun & DiVesta, 1976).

Figure 1
An Empirical Model Indicating the Input Role of Investor Risk Tolerance, as Predicted by Eight Demographic Characteristics, Leading to the Establishment of Objectives and the Development of an Investment Management Strategy.



The use of more sophisticated statistical methods and a renewed research interest in life-cycle analysis marked a changing point in age/risk-tolerance research in the 1980s. Since that time, the majority of published research studies indicate that, through the life cycle, risk tolerance tends to decrease with age (Bajtelsmit & VanDerhei, 1997; Bakshi & Chen, 1994; Brown, 1990; Dahlback, 1991; Goodfellow & Schieber, 1997; Hawley & Fujii, 1993-1994; McInish, 1982; Morin & Suarez, 1983; Palsson, 1996; Sung & Hanna, 1996a).

Marital status

Investment managers consider marital status (i.e., married, never married, divorced, separated, and widowed) an effective factor in distinguishing among levels of investor risk tolerance for two reasons. First, it is assumed that single individuals have less to lose by accepting greater risk compared to married individuals who often have responsibilities for themselves and dependents (Lazzarone, 1996; Lee & Hanna, 1991; Roszkowski et al., 1993). Second, it is assumed that married individuals are more susceptible to social risk, which is defined as the potential loss of esteem in the eyes of colleagues and peers, if an investment choice leads to increased risk of loss (Roszkowski et al.). Other researchers have suggested that married individuals, not singles, possess greater risk-taking propensities, although others have failed to find any statistically significant relationship between marital status and risk tolerance (Haliassos & Bertaut, 1995; Masters, 1989; McInish, 1982).

Occupation

As defined in this research, occupation refers to the principal activity in which someone engages for pay. Examples include the following: manual labor, physician, manager, educator, and administrative personnel. Some investment managers and researchers have concluded that higher ranking occupational status (e.g., business executive, attorney, etc.) can be used as a classification factor related to higher levels of investor risk tolerance (Blume, 1978; Haliassos & Bertaut, 1995; Lee & Hanna, 1995; Leonard, 1995; Masters, 1989; Quattlebaum, 1988; Roszkowski et al., 1993; Sung & Hanna, 1996a, 1996b). It appears that individuals who take less risks typically choose occupations with relatively small economic and political risks (Barnewall, 1988).

Self-Employment

Someone is generally considered to be self-employed if their income comes directly from their own business, trade, or profession rather than through salaries or wages from an employer. Investment managers have assumed that self-employment status automatically leads to higher levels of risk-taking, and that, other things being equal, self-employed individuals will typically choose riskier investments and accept increased investment volatility as compared to people who work for others on a straight salary (Grey & Gordon, 1978; MacCrimmon & Wehrung, 1986; Meyer, Walker, & Litwin, 1961).

Income

According to MacCrimmon and Wehrung (1986), upper income persons (i.e., individuals with incomes greater than $70,000 per year from all sources and before taxes) and millionaires (i.e., individuals who derive a portion of their income from assets valued at more than $1 million) tend to take greater risks than individuals with lower incomes. Investment managers have concluded that increasing income levels are associated with access to more immediate resources (O'Neill, 1996), leading some to conclude that increased levels of income lead to increased levels of risk tolerance (Blume, 1978; Cicchetti & Dubin, 1994; Cohn, Lewellen, Lease & Schlarbaum, 1975; Friedman, 1974; Goodfellow & Schieber, 1997; Hawley & Fujii, 1993-1994; Lee & Hanna, 1991; Riley & Chow, 1992; Schooley & Worden, 1996; Shaw, 1996; Xiao & Noring, 1994).

Race

According to researchers such as Zhong and Xiao (1995) and Sung and Hanna (1996a), different cultural values, preferences, and tastes may affect the risk tolerance of Whites and non-Whites. There is general consensus among personal finance researchers that Whites have higher investor risk tolerances than non-Whites (Haliassos & Bertaut, 1995; Hawley & Fujii, 1993-1994; Lee & Hanna, 1995; Lefcourt, 1965; Sung & Hanna, 1996a; Zhong & Xiao, 1995). Possible causes of the racial difference include: (a) non-Whites may not have the same exposure to banks and other financial institutions as Whites, (b) minority groups may be exposed to non-traditional investment opportunities, (c) many non-White cultures tend to be oriented towards the past or present rather than oriented towards future returns (Zhong & Xiao), and (d) Whites, in general, may possess greater confidence in their analytical and decision making skills (MacCrimmon & Wehrung, 1986).

Education

Some researchers have argued increased levels of education (i.e., formal attained academic training) allows someone to assess risk and benefits more carefully than someone with less education. Higher education has been found to encourage risk taking (MacCrimmon & Wehrung, 1986), and as such, investment managers assume that increased levels of education are associated with increased levels of risk tolerance (Baker & Haslem, 1974; Haliassos &

Bertaut, 1995; Hammond, Houston, & Melander, 1967; Lee & Hanna, 1995; Masters, 1989; Shaw, 1996; Sung & Hanna, 1996a, 1996b; Zhong & Xiao, 1995).

Research Summary

There is still a persistent belief among investment managers and researchers that (a) men are more risk tolerant than women, (b) older individuals are less risk tolerant than younger people, (c) single individuals are more risk tolerant than marrieds, (d) certain occupations are associated with increased and decreased levels of risk tolerance, (e) individuals with greater income have greater risk tolerances than lower income earners, (f) non-Whites tend to be less risk tolerant than do Whites, and (g) greater educational attainment is associated with increased risk tolerance. Investigators know that "there are research data in support of these beliefs, but there are also data indicating otherwise" (Botwinick, 1984, p. 166). In other words, additional research is warranted.

Methodology

The 1992 Survey of Consumer Finances (SCF) was used as the dataset for this study. The SCF is sponsored by the Federal Reserve Board in cooperation with the Department of the Treasury and is conducted by the National Opinion Research Center at the University of Chicago. Respondents with incomes above $1 million were eliminated from the sample as a way to reduce the effect that extreme values have on variance estimates. This exclusion resulted in a sample of 2,626 respondents.[e]

The dependent variable was operationalized as respondent answers to the following risk assessment question in the SCF:

> Which of the following statements on this page comes closest to the amount of financial risk that you are willing to take when you save or make investments?

The possible responses were as follows:

1. Take substantial financial risks expecting to earn substantial returns
2. Take above average financial risks expecting to earn above average returns
3. Take average financial risks expecting to earn average returns
4. Not willing to take any financial risks

The total weighted SCF distribution of responses to the risk assessment item was 3.7%, 14.6%, 42.1%, and 39.6%, respectively. Responses to the substantial risk category were insufficient to be used appropriately in this multivariate analysis using multiple levels within the eight independent variable categories. Therefore, the substantial and above average risk categories were combined into a single category, consisting of 18.3% of sample respondents. The final dependent variable was comprised of three categories: (a) high risk tolerance, (b) average risk tolerance, and (c) no risk tolerance. A summary of the operationalized independent variable definitions is provided in the appendix.

Data Analysis Method

In this study it was assumed that investment managers do not assign precise values to investor risk tolerance on a continuous variable. It was assumed instead that investor risk tolerance is more likely considered to fall within one of three categories: high, average, or no risk tolerance (MacCrimmon & Wehrung, 1986; Roszkowski et al., 1993). Based on this assumption, the statistical method, discriminant analysis,[f] was used to separate, discriminate, estimate, and classify individuals into risk-tolerance categories using respondents' demographic factors (Huberty, 1975).

Findings

The unweighted sample used in this analysis provided a unique insight into the demographic profile of the "typical" financial planning and investment management client. On average, the sample best represented a married, middle-aged White male, employed in a professional occupation, often self-employed, with a higher than average income and education. While this sample profile matched that of financial planning clientele and more affluent investors, generalizations are thus limited to this demographic profile. A complete demographic profile of the sample is provided in the appendix.

Discriminant Analysis Test Results

The first step in the discriminant analysis required a test of the proposition that the mean vectors of the high, average, and no risk-tolerance categories were equal. Based on the Wilks' Lambda statistic,[g] the independent variables, as used in the proposed model, significantly discriminated among levels of risk tolerance, and the three groups were distinct.

Determination of Differentiating Variables

Table 1 provides the means, standard deviations, and statistical significance of the independent variables on

the three levels of investor risk tolerance (i.e., high, average, and none). Note that for dichotomous variables, the mean is the proportion of cases with a value of one. For example, 93% of respondents in the high risk-tolerance category were men, compared to 87% in the average risk-tolerance category, and 75% in the no risk-tolerance category (i.e., $\underline{X}$ = .93 for high-risk tolerance, $\underline{X}$ = .87 for average risk tolerance, and $\underline{X}$ = .75 for no risk tolerance). conversely, 7% , 13%, and 25% of the respondents in the high, average, and low risk tolerance categories, respectively, were women. F-test results indicated that the following demographic characteristics were significant in differentiating among levels of risk tolerance: gender; married status; single but previously married status; professional occupational status; self-employment status; income; White, Black, or Hispanic racial background; and educational level. Three demographic characteristics, namely age, never married, and Other Race, were not significant.

Table 1
Group Means, Standard Deviations, and Significance of Classifying Variables

Variable*	High Risk Tol.	Average Risk Tol.	No Risk Tol.	Significance	
	Mean	Mean	Mean	F	Pr > F
Male	.93	.87	.75	53.85	.0001
Age	44.65	44.93	43.76	1.96	.1413
Marital Status Single but previously married	.12	.13	.24	25.63	.0001
Never Married	.11	.13	.12	.62	.5398
Married	.77	.74	.64	17.17	.0001
Professionals	.56	.51	.29	74.02	.0001
Not Self-Employed	.52	.65	.79	66.80	.0001
Total Household Income ($1,000)	165.80	120.55	61.04	73.90	.0001
Race					
Black	.06	.06	.14	23.14	.0001
Hispanic	.04	.03	.10	25.38	.0001
Other Race	.04	.05	.06	1.87	.1541
White	.87	.86	.70	51.05	.0001
Education	15.16	14.53	12.87	164.34	.0001

*For dichotomous variables, mean is the proportion of cases with a value of 1.00.

Once it was determined that the three levels of investor risk tolerance differed significantly on the independent variables, and it was ascertained which demographic variables were significant in differentiating among risk-tolerance categories, the derivation of standardized canonical structures, with accompanying coefficients, was undertaken.[h] Standardized coefficients are of particular value, because they allow variables to be "compared with one another so as to determine which of the classifying factors are most effective as classifiers within the context of the corresponding discriminant equation" (Huck, Cormier, & Bounds, 1974, p. 168). Thus, the values associated with the standardized coefficients can be considered analogous to beta weights in regression analysis or scores in factor analysis. Unlike normalized coefficients, standardized coefficients take into account correlations and interactions between and among variables, with larger standardized coefficients indicating more explained variance than smaller coefficients.

Interpretation of the standardized canonical coefficients (Table 2) involved determining which demographic characteristics were most useful in defining the underlying construct of investor risk tolerance. Thus, the variables that shared the most variation with the first and second canonical structures were found to define what attribute the structure represented (Huberty, 1994). The results indicated that scores on Canonical 1, which explained 93.60% of risk-tolerance variability, were scores on an attribute that was fundamentally comprised of education and gender, (coefficients of .6178 and .4498, respectively). The second canonical structure, Canonical 2, was defined basically by the remaining variables. Therefore, it was determined that education and gender explained the most between-group variability, and that these two variables contributed the most towards discriminating among the three levels of investor risk tolerance. Stated another way, it was determined that investor risk tolerance, as a construct, was best described by a combination of education and gender.

Table 2
Standardized Canonical Discriminant Function Coefficients

Variable	Canonical 1	Canonical 2
Male	0.45	0.17
Age	-0.12	-0.42
Married (reference category)		
Single but previously married	0.07	0.42
Never Married	0.22	-0.12
Professional	0.11	-0.40
Not Self-Employed	-0.28	-0.58
Household Income	0.24	0.43
Black	-0.17	0.44
Hispanic	-0.13	0.45
Other Race	-0.12	0.00
White (reference category)		
Education	0.62	0.06

Classification Results

A generalized squared distance function using a posterior probability of membership in each risk category was used to estimate the classification success of the demographic variables used in this study. Table 3 provides the classification of results showing that out of 628 actual subjects in the high risk-tolerance category, the model was able to classify 340 or 54% correctly; of the 1,144 subjects actually in the average risk-tolerance category, the model was able to classify 396 or 35% correctly; and of the 854 subjects actually in the no risk-tolerance category, the model was able to correctly classify 532 or 62%. Overall, the procedure correctly classified 48% of respondents. The classification procedure was statistically significant at the .01 level.

The classification procedure over classified respondents into high and no risk-tolerance levels, while under classifying respondents into the average risk-tolerance category. The danger in this classification process is apparent in practical application. These false-positive classifications can lead to asset allocations that are too aggressive, which could cause some individuals who were mis-classified to sell securities at a loss (Train, 1995). In summary, the equations, while working better than by chance, should be used with caution.

Table 3

Classification of Results

	Predicted High Risk	Predicted Average Risk	Predicted No Risk	Actual Group Membership	% Correct Classifications
High Risk	340	171	117	628	54.14%
Average Risk	394	396	354	1,144	34.62%
No Risk	128	194	532	854	62.32%
Total	862	761	1003	2,626	48.29%

Conclusions and Implications

The purpose of this study was to determine whether the variables gender, age, marital status, occupation, self-employment, income, race, and education could be used individually or in combination to both differentiate among levels of investor risk tolerance and classify individuals into risk-tolerance categories. This research endeavor was successful in addressing the dual purpose of the study. First, seven of the eight demographic characteristics were found to be effective in differentiating among levels of risk tolerance, and second, demographic variables were found to work, both individually and in combination, to classify individuals into risk-tolerance categories. The following discussion details the implications these findings have for investment managers and researchers.

As noted in the introduction, financial planners, counselors, and investment managers often rely on demographics to differentiate among levels of risk tolerance and to classify investors into risk-tolerance categories. Findings from this study indicate that some demographic characteristics do work in helping investment managers differentiate and classify. However, results also suggest that some demographic characteristics work better than others. Assuming that financial planners and counselors will continue to use demographic factors in the future, clarification of which ones work the most effectively is needed. Based on the results of this study, the following two demographics, presented in a heuristic form, are offered as the most effective differentiating factors:

(a) individuals with greater levels of attained education are proportionately more likely to have higher risk tolerances than individuals with lower attained educational levels, and
(b) men tend to be proportionately more risk tolerant than women.

Although there are contrary studies for both of these heuristics, the preponderance of research is supportive, as noted earlier. more studies dispute the relationship between gender and risk tolerance than between educational level and risk tolerance (for further discussion of this see Grable, 1997). Perhaps the importance of these findings lies not in the validation of the heuristic, but of the implications of their use in practice. For example, publications like *Money* (Belsky, Kobliner, & Walmac, 1993) lend credence to the assumption that men generally prefer more risk than women when investing. Yet demographic trends for women (e.g., longer life expectancy, lower lifetime earnings potential, and increased likelihood of single parenthood and responsibility for children) suggest a strong need for women to prudently use risk to insure an adequate return for meeting financial needs. Although analysis of assets as a proxy for risk aversion has practical and theoretical limitations (Blaug, 1992), recent research on private (Bajtelsmit & VanDerhei, 1997) and government (Hinz et al., 1997) pension holdings reported that women's choices were more risk averse, and that lower returns associated with these lower-risk portfolios could "exacerbate the gender gap in retirement income over time" (Hinz et al., p. 99). Financial advisors and educators have a responsibility to educate women about the risk-return trade-off involving investments, retirement planning, and insurance. A similar argument could be made for helping those with less formal education to fully understand the implications of their choices.

Planners and counselors are further cautioned to note that the most widely used demographic in differentiating among levels of risk tolerance and in classifying investors into risk-tolerance categories, a person's age, was not found to be significant. The reporting and acceptance of findings which support the inverse relationship between age and level of risk tolerance has become so widespread that there is now substantial consensus among financial advisors that as one ages, the cash portion (i.e., a risk-free asset) of one's portfolio should be increased (Reichenstein, 1996). The trade press has even advocated using age-based formulas to create simple investment management strategies to account for the perceived negative relationship between age and risk tolerance (e.g., Bengen, 1996; Gitter, 1995; Kapiloff, 1994). However, the nuance of the practical wisdom of portfolio management as prescribed here is not to be confused with the classification of investor risk tolerance. Age, as a proxy for risk tolerance, when considered with the other issues of goals, time horizon, and financial stability may support the prescribed investment management strategies. But this same logic does not suggest that age is *always* an effective differentiating factor among levels of risk tolerance. This study and other recent studies (Cutler, 1995; Gehrels, 1991; Haliassos & Bertaut, 1995; Hinz et al., 1997; Holland, 1991; Lee & Hanna, 1991) have not found age to have a significant effect on risk tolerance, while Wang and Hanna (1997) found it to be positively related to a measure of risk tolerance based on portfolio composition. Other studies suggest that the relationship between age and risk tolerance is not linear (Bajtelsmit & VanDerhei, 1997; Riley & Chow, 1992; Weagley & Gannon, 1991). Long-term implications can be equally devastating for the young person who invests retirement dollars too conservatively, perhaps for a lifetime (e.g., Goodfellow & Schieber, 1997), or the retiree or near-retirement age individual who assumes too great a risk position. Again, the need for education and advice to encourage prudently assumed risk in a diversified portfolio is an important issue for both young and old alike.

This finding has important implications for investment managers. For instance, relying on age as a factor in classifying someone into a risk-tolerance category, without taking into account other factors, such as income, education, occupation, and other objective client attributes, works no better than classification by random selection. In effect, financial planners, counselors, and investment managers who continue to rely on age as a useful differentiating and classifying factor, run two risks. First, it is likely that current and prospective clients will be placed into a risk-tolerance category that is incorrect. This is called a false-positive classification, which may lead to extreme portfolio allocations for those clients who are classified incorrectly (especially in those cases where someone is incorrectly classified into a high or no risk-tolerance level). Second, the use of age as a differentiating factor may ultimately lead to what Palsson (1996) called a dispersion in wealth and welfare, because clients who are mis-classified may (a) sell at a loss if incorrectly classified into a higher risk category, or (b) fail to meet goals and objectives if wrongly classified into a lower risk category. In either case, the fiduciary credibility of an investment manager who uses age as a

differentiating and classifying factor may be questioned.

Instead of relying on statistically insignificant demographic factors, such as age, to differentiate among levels of risk tolerance and to classify individuals into risk-tolerance categories, financial planners, counselors, and investment managers would be better advised to use demographic variables which optimize the separation of the three levels of risk tolerance. As discussed above, the variables of educational level and gender appear to offer the best discriminating power when used to determine into which level of risk tolerance a current or potential client will most likely fall. For those planners and counselors who want to use only one demographic factor to differentiate among levels of risk tolerance, the education variable is the optimal factor.

The final implication from this research involves the importance that financial planners and counselors should place on demographics during the input phase of the investment management process. Overall, the demographic variables examined in this study explained approximately 20% of the variance in risk-tolerance differences, leaving 80% of total variance in risk-tolerance difference unexplained. Demographics were found to provide an incomplete picture of respondents' risk tolerances.

In summary, demographic characteristics appear to provide only a starting point in assessing investor risk tolerance. As the results of this study indicate, understanding risk tolerance is a complicated process that goes beyond the exclusive use of demographics. risk tolerance is not a simple one-dimensional or multidimensional attitude; it may well be sub-dimensional (Bonoma & Schlenker, 1978; Cutler, 1995). More research is needed to determine which additional factors, such as expectations, attitudes, preferences, previous experiences, family background and culture, *or* financial stability factors, can be used by investment managers to increase the explained variance in risk-tolerance differences.

Appendix

Table A-1
Variable Definitions

Variable	Measurement
Gender	1 = male 0 = female
Age	Respondent's age (18 - 87)
Marital Status	1 = married 0 = not married 1 = single but previously married 0 = not single but previously married 1 = never married 0 = other than never married
Occupation	1 = professional 0 = non-professional
Self-Employment	1 = not self-employed 0 = self-employed
Income	Respondent's income
Race: White Black Hispanic Other	1 = White, 0 = not White 1 = Black, 0 = not Black 1 = Hispanic, 0 = not Hispanic 1 = Other Race*, 0 = not Other Race
Education	Respondent's education (1 - 17)

*The "Other Race" category was a category on the SCF public use tape, and included native American/Eskimo/Aleut, Asian or Pacific Islander, and Others.

Table A-2
Demographic Characteristics of Respondents (Unweighted)
(N = 2,626)

Demographic Characteristics	Frequency	%* or Mean
Gender		
Male	2,223	84.66
Female	403	15.35
Mean Age (Years)	n.a.	44.50
Marital Status		
Married	1,878	71.52
Single But Previously Married	436	16.60
Never Married	312	11.88
Occupation		
Professional	1,186	45.16
Non-Professional	1,440	54.84
Self-Employment Status		
Self-Employed	877	33.40
Not Self-Employed	1,749	66.60
Mean Total Household Income	n.a.	$112,016
Race		
Black	219	8.34
Hispanic	152	5.79
Other Race	129	4.91
White	2,126	80.96
Mean Educational Attainment (Years)	n.a.	14.14

*Percentage may not add to 100 due to rounding.

Endnotes

a. *An investment manager was defined in this research as a financial planner or investment advisor. Financial planners and investment advisors are individuals who are paid to "advise clients about personal finances. He or she has usually undergone training and has met the qualifications for particular professional certifications" (Garman & Forgue, 1997, p. G10).*

b. *Although the importance of quantifying and understanding individual investor risk tolerance is recognized as a key input into the investment management decision making process, "most everything one reads in the financial press and in the glossy publications of money managers and mutual funds still touts investment returns, with rarely a comment about the risk taken" (Trone et al., 1996, p. 73). This emphasis on returns rather than risk may be the result of the subjective nature of investor risk tolerance. Some investors fail to measure risk, and when they do, they often use demographics, in the form of risk-tolerance heuristics (e.g., men are more risk-tolerant than women and older individuals are more risk-averse than younger persons), as predictors of investor risk tolerance.*

c. *The term "heuristics" is often used to describe mental strategies that people use to reduce difficult tasks to simpler judgments (Deacon & Firebaugh, 1988; Fischhoff, Slovic, & Lichtenstein, 1979). According to Payne (1973), "individuals find it difficult to process information and therefore employ decision strategies designed to reduce the information processing load" (p. 440). As is the case when dealing with investor risk tolerance, heuristics may be useful in certain situations, but in other circumstances heuristics can lead to "errors that are large, persistent, and serious in their implications" (Fischhoff et al., p. 19). Researchers, such as Heisler (1994), have suggested that frequently individuals are not aware that they are making poor decisions when using risk-tolerance heuristic judgments.*

d. *Losses occur when an investor abandons an asset allocation plan or investment strategy "because of unwelcomed volatility" (Trone et al., 1996, p. 83). Investors will likely forfeit their chances of achieving desired investment objectives and abandon an investment program for its volatility of returns than for any other reason according to Trone et al. "Consequently, this manifestation of risk (i.e., aversion to losses) is the crucial parameter for the investor's determination of an optimal asset allocation" (Trone et al., p. 83).*

e. *The 1992 SCF consists of five replicates. The replicates were designed to enable estimation of data variability caused by missing responses. Data differs across implicates due to the imputation of missing data using stochastic multivariate estimation procedures linked to the respondent's background variables. Because discriminant analysis relies on the heterogeneity of the covariance matrix which is skewed when more than one implicate is used, SAS, the statistical program used in this analysis, was unable to employ the multiple imputation technique as outlined by Montalto and Sung (1996). Thus, the first implicate of the SCF was used as the data set in this analysis.*

f. *The technique of multiple discriminant analysis was first developed by Fisher in 1936 (Eisenbeis & Avery, 1972; Huberty, 1975; Klecka, 1980). The procedure has a solid foundation of previous use in the social sciences. The method can be viewed as a logical extension of multiple analysis of variance (MANOVA), because a hypothesis of equal means is tested using sample estimates of means and common variance (Huberty; Klecka; Scott, 1974). In the univariate case, random samples of observations on a single variable are taken, and a test is performed by partitioning the total sample variance into (a) pooled within-group variance about group means, and (b) the variance of the group means about the grand mean. The explained between-group variance is then compared to the unexplained within-group variance. Based on the results of this test, the hypothesis is either accepted or rejected. The univariate case can be extended easily to a multivariate situation, where the dependent variable consists of more than two categories. In the multivariate case, a linear function can be used to maximize the between-group variance of the dependent variable divided by the pooled within-group variance of the dependent variable.*

g. *The test of this proposition was evaluated using the Wilks' Lambda statistic. Wilks' Lambda was calculated to be .811. This was equivalent to an F ratio of 26.2262 with 22 and 5,226 degrees of freedom. The probability of obtaining an F this large by chance was less than .0001.*

h. *Multiple discriminant analysis always results in at least two canonical structures. The maximum number of possible structures is equal to one less than the number of criterion levels or to the number of classifying variables, whichever is smaller (Huck, Cormier, & Bounds, 1974). The discriminant functions have the same variables, but the numerical coefficients associated with each function are different, indicating that the two functions do not contribute equally to successful differentiation among risk-tolerance levels. In effect, each function explains a certain percentage of the between-group variation. The first canonical function in this analysis accounted for 93.60% of the between-group variability, while the second canonical function accounted for the remainder. Both canonical structures were statistically significant at the .01 level.*

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