

Exploring the Effect of Demographic and Other Variables on Investor Risk Tolerance Propensity

K. Arun Prasad

Assistant Professor, Department of Management Studies, Saranathan College of Engineering, Tiruchirappalli, Tamil Nadu

Abstract: Understanding financial risk tolerance and determining an individual's willingness and capacity to take on risk is an essential part of financial and indeed economic planning. Increasingly planners draw on the behavioral economics literature. Determining a client's financial risk tolerance is a crucial part of the investment management process. In assessing the risk profile of a system or individual, it is generally seen that there are four main inputs (1) goals, (2) time horizon (3) financial stability, and (4) risk tolerance (Garman & Forgue, 1997). The final input, risk tolerance, is one of a more subjective than objective nature and thus is much more difficult to measure. Although countless attempts have been made to come up with a more precise quantitative measure for this final input, there is no one size fits all approach to measuring risk tolerance and such it has attracted a high level of interest among a range of schools of thought worldwide and merits further insight and investigation.

Keywords: Investor risk tolerance, demographic variables, investor financial planning horizon, net wealth

I. INTRODUCTION

In project management, risk tolerance is the measure of the degree of uncertainty that a stakeholder accepts in respect of the project risk assessment. In finance, risk is the chance that the return achieved on an investment will be different from that expected, and also takes into account the size of the difference. This includes the possibility of losing some or all of the original investment. In a view advocated by Damodaran, risk includes not only "downside risk" but also "upside risk" (returns that exceed expectations). Some regard the standard deviation of the historical returns or average returns of a specific investment as providing some historical measure of risk; see modern portfolio theory. Financial risk may be market-dependent, determined by numerous market factors, or operational, resulting from fraudulent behavior (e.g. Bernard Madoff). Recent studies suggest that testosterone level plays a major role in risk-taking in financial decision-making.

A fundamental idea in finance is the relationship between risk and return. The greater the potential return one might seek, the greater the risk that one generally assumes. A free market reflects this principle in the pricing of an instrument: strong demand for a safer instrument drives its price higher (and its return correspondingly lower) while weak demand for a riskier instrument drives its price lower (and its potential return thereby higher).

For example, a US Treasury bond is considered to be one of the safest investments and, when compared to a corporate bond, provides a lower rate of return. The reason for this is that a corporation is much more likely to go bankrupt than the U.S. government. Because the risk of investing in a corporate bond is higher, investors are offered a higher rate of return.

Risk attitude, appetite and tolerance

The terms attitude, appetite and tolerance are often used similarly to describe an organization's or individual's attitude towards risk taking. Risk averse, risk neutral and risk seeking are examples of the terms that may be used to describe a risk attitude. Risk tolerance looks at acceptable/unacceptable deviations from what is expected. Risk appetite looks at how much risk one is willing to accept. There can still be deviations that are within a risk appetite. For example, recent research finds that insured individuals are significantly likely to divest from risky asset holdings in response to a decline in health, controlling for variables such as income, age, and out-of-pocket medical expenses.

Gambling is a risk-increasing investment, wherein money on hand is risked for a possible large return, but with the possibility of losing it all. Purchasing a lottery ticket is a very risky investment with a high chance of no return and a small chance of a very high return. In contrast, putting money in a bank at a defined rate of interest is a risk-averse action that gives a guaranteed return of a small gain and precludes other investments with possibly higher gain. The possibility of getting no return on an investment is also known as the Rate of Ruin.

Risk tolerance and demographic factors

Understanding financial risk tolerance and determining an individual's willingness and capacity to take on risk is an essential part of financial and indeed economic planning. Financial planners and portfolio managers will often allocate a large part of their time in considering individual clients' "preferences and perceptions of risk" to try to increase client retention via a more appropriately structured product many financial planners will employ tactics such as situational profiling using wealth and life stage, as well as psychological measures to achieve this. Increasingly planners draw on the behavioral economics literature.

Determining a client's financial risk tolerance is a crucial part of the investment management process. In assessing the risk profile of a system or individual, it is generally seen that there are four main inputs (1) goals, (2) time horizon (3) financial stability, and (4) risk tolerance (Garman & Forgue, 1997). The final input, risk tolerance, is one of a more subjective than objective nature and thus is much more difficult to measure. Although countless attempts have been made to come up with a more precise quantitative measure for this final input, there is no one size fits all approach to measuring risk tolerance and such it has attracted a high level of interest amongst a range of schools of thought worldwide and merits further insight and investigation. Further, according to (Anbar & Eker, 2010) there are four main methods found in the literature for measuring financial risk tolerance, which include (a) assessing actual behavior (for example, portfolio allocations may be used to infer attitudes to risk), (b) asking about investment choices, (c) asking a combination of investment and subjective questions and (d) asking hypothetical questions with carefully specified scenarios. For the purpose of this paper we wish to focus mainly on financial risk tolerance.

II. LITERATURE REVIEW

Risk Tolerance Overview

An individual investor's FRT has been variously defined in the literature but can perhaps best be described as the extent to which the investor "... is willing to risk experiencing a less favourable financial outcome in the pursuit of a more favourable financial outcome" (International Organization for Standardization [2006]). Determining an investor's FRT is a prerequisite to formulating a suitable investment strategy. Modern portfolio theory builds on expected utility theory as a basis for identifying investment choices in the presence of risk. Measurement of the degree of risk aversion is central to identifying the optimal investment which maximizes expected utility.

Where the expected risky payoff is greater than the certain outcome it is necessary to assess the degree of risk aversion. The higher the risk aversion, the lower an investor's tolerance for risk (and the higher is the expected return demanded for a given level of risk). Grable [2008] suggests risk tolerance can be decomposed into two parts: risk attitude and risk perception following Weber and Milliman [1997] who define risk preference as the "tendency to be attracted or repelled by alternatives that he or she perceives as more risky over alternatives perceived as less risky" (emphasis added). With such a measure of the trade-off between expected utility and expected risk and return inputs, the investor guided by modern portfolio theory can choose the optimal, efficient mix of risky and risk-free assets.

Pragmatically, properly identifying an investor's FRT is important within a financial advisory relationship as advisers have the responsibility of understanding their clients' disposition towards risk before being able to recommend

appropriate strategies. The requirements generally align with Hanna and Chen's [1997] decomposition of risk tolerance into subjective risk tolerance and objective risk tolerance. The former is linked with the economic concept of risk aversion, whereas the latter is based on the objective circumstances of the household, including financial resources, employment status and planning period.

A person's propensity for risk-taking behaviour is considered multidimensional in nature, with subjective components and a susceptibility to a range of motivational and other factors (Slovic [1964]). Jackson, Hourany and Vidmar [1972] consider risk-taking behaviour to be a higher order construct comprised of at least four major facets or dimensions across which variation might be observed: monetary risk-taking, physical risk-taking, ethical risk-taking and social risk-taking. This notion of domain specificity with regard to risk tolerance has been explored and evidenced (Hsee and Weber [1999], Zaleskiewicz [2001], Rolison and Scherman [2003], Weber, Blais and Betz [2002], Johnson, Wilke and Weber [2004], Corter and Chen [2006]).

In the context of a person's predisposition towards financial risk-taking behaviour and thus FRT, questions concerning the temporal stability of FRT have emerged in the literature and issues associated with the reliability of measures used to proxy an investor's FRT have been raised. Shefrin [2002] suggests "... people are not uniform in their tolerance to risk. It depends on the situation ... [and] ... on several factors, one being recent experience facing risk" [pp. 27- 28]. Grable et al. [2004] conclude that financial risk tolerance "... appears to be an elastic and changeable attitude ... [and] ... stock market price data does influence risk tolerance attitudes" [pp. 142, 145].

A number of other cross-sectional studies have reported associations between FRT and market activity or mood/sentiment and thereby cast doubt upon the notion of FRT stability (Grable and Lytton [1999], Grable [2000], Yao, Hanna and Lindamood [2004]). In contrast, several studies report FRT to be a fairly stable measure and not materially associated with such factors (notably Yip [2000], Santacruz [2009]).

The importance of questionnaire design to the meaningful measurement of FRT has been examined (Yook and Everett [2003], Roszkowski, Davey and Grable [2005], McCarthy [2009], Roszkowski, Delaney and Cordell [2009], Marinelli and Mazzoli [2010], Pan and Statman [2010]). The key weaknesses of FRT survey instruments appear to revolve around questionnaires: (1) with insufficient items to reliability capture the essence of a person's FRT (e.g. single question or small number of questions); (2) that include important items relevant to the ultimate asset allocation decision, yet irrelevant to assessing risk tolerance (such as questions that address risk capacity or risk perception, not tolerance); (3) whose average FRT measure for an individual masks underlying intra-test-item variability (and so may not reflect the person's characteristic risk tolerance for particular situations); and (4) borne out of subjective 'in-house' construction of their

content (thereby stifling standardisation and convoluting comparative analyses).

Demography Factors

Hallahan, Faff and McKenzie (2004: 57) define personal financial tolerance as an indication of "...a person's attitude towards accepting risk..." Risk tolerance is generally accepted to be the inverse of the economist's concept of risk aversion (Faff, Mulino and Chai, 2008: 2; Hanna *et al.*, 2001: 54). A distinction is made between objective and subjective financial risk tolerance related to the framework used to measure risk tolerance. The objective approach employs the Arrow-Pratt utility framework to derive a measure of risk aversion by determining the ratio of risky assets to wealth (Chaulk *et al.*, 2003: 258 and Chang, DeVaney and Chiremba, 2004: 54). A subjective measure of risk tolerance, on the other hand, involves posing hypothetical questions to individuals requiring them to choose between risky alternatives.

International studies have employed both subjective and objective measures of risk tolerance to investigate the relationship between various demographic factors such as age, race, gender, marital status, religion and income/wealth that potentially affect an individual's desire or appetite for risk. The literature reviewed often shows conflicting results with some studies finding positive relationships between the level of risk tolerance and a variable, whilst others find a negative or no relationship for that specific variable.

We are only aware of two South African studies that have attempted to analyze the relationship between subjective financial risk tolerance and demographic factors. Strydom, Christison and Gokul (2009) employed a subjective risk tolerance measure, developed by Hanna and Lindamood (2004), for a sample of 84 third and fourth year Accounting and Finance students at the University of KwaZulu-Natal's Pietermaritzburg campus but their limited sample and methodological approach restricted their analysis. Gumede (2009) attempted to improve on the Strydom *et al.* (2009) study by employing a larger and more diverse sample of first year Economics students (also at the University of KwaZulu-Natal's Pietermaritzburg campus), more variables and a more sophisticated form of statistical analysis, the ordered dependent variable method. Their findings are presented below together with the international evidence.

Age

Intuitively, one would expect financial risk tolerance to decrease as individuals get older as younger investors have more time to recover any financial losses and can replace leisure time with more work to compensate for any portfolio losses (Al-Ajmi, 2008: 15). The life-cycle hypothesis therefore theorises that risk tolerance decreases with age. Morin and Suarez (1983: 1210-1213); Schooley and Worden (1996: 92); Hallahan *et al.* (2004: 75) and Jiankopolos and Bernasek (2006: 999) all found evidence that risk tolerance decreased consistently with age.

Gender

Previous research on the topic of gender and financial risk tolerance has been extensive and generally concluded that women are more risk averse than men and that men favoured more risky assets compared to women (Palsson, 1996: 785, Hartog *et al.*, 2000: 11, Hallahan *et al.*, 2004: 67 and Al-Ajmi, 2008: 21-22). Powell and Ansic (1997: 622), using computer-based experiments concluded that females had a much higher risk aversion level than males, regardless of the degree of familiarity, frame or cost. Coleman (2003: 106, 109) found that women illustrated a higher level of risk aversion when compared to men but when comparing the ratio of risky assets to net worth for the same age categories, there was no significant difference in the ratios for men and women younger than 40 but women over the age of 40 had a lower ratio than men in the same age category. Hanna and Lindamood (2004: 34); Charness and Gneezy (2007: 13); Faff *et al.* (2008: 13-16) and Olivares *et al.* (2008: 10) also found that females were more risk averse than males.

Income and Wealth

One would expect that as an investor's income and wealth increases they would be able to uphold a higher degree of financial risk (Cohn *et al.*, 1975: 610) but the converse to this may also be true. In the former case the perception may be that as an individual attains higher income his/her ability to tolerate losses is greater, whilst on the other hand an investor maybe come more prudent with higher income so as to avoid losing their hard-earned wealth (Hallahan *et al.*, 2004: 58). Morin and Suarez (1983: 1210) found that households in the upper wealth group showed a trend of decreasing relative risk aversion. Additionally, in their study wealth was found to be the most important variable in determining risk aversion levels. Similarly, Grable and Lytton (1999b: 6) found that a higher level of income was related to an above-average level of risk tolerance.

Marital Status

Barber and Odean (2001: 285) found that single individuals held more volatile (i.e. risky) portfolios than those who were married. Hallahan *et al.* (2004: 71) also concluded that single investors were less risk averse and thus, that marital status was a significant determinant in financial risk tolerance levels. Hawley and Fujii (1994: 202) found evidence that male heads of households and married men had very similar risk preferences, whilst single men preferred higher level of financial risk. Similarly, comparing females, they found that married women were the most risk tolerant, followed by single women and then female heads of households. Yao *et al.* (2005: 56), reported that married females preferred lower levels of risk when compared to similar married men, whilst single males were more willing to take on high and substantial levels of risk compared to married males.

Education

Numerous studies have found that there is a positive relationship between the level of education obtained and risk tolerance. Riley and Chow (1992: 34); Schooley and Worden (1996: 92); Sung and Hanna (1996: 14); Donkers et al. (2001: 185); Grable and Joo (2004:78); Bellante and Green (2004: 280); Chang et al. (2004: 62); and Kimball et al. (2007: 20) all concluded that education was positively related to financial risk tolerance. Bellante and Green (2004: 280) further found that differences in education levels accounted for larger variations in asset allocation than any other variable they examined. Chang et al. (2004: 62-64), in comparing subjective and objective risk tolerance, found that education was significant predictor of subjective risk tolerance and that the ratio of risky assets to net worth was higher for respondents in the higher educational categories. As a result, Chang et al. (2004: 65) concluded that financial advisors should be cognizant of the educational backgrounds of their clients when giving advice due to the fact that clients with lower qualifications may need more information when making investment decisions.

III. RESEARCH OBJECTIVES

1. To determine the financial risk tolerance (subjective measurement)
2. To determine whether a set of demographic, socioeconomic, and attitudinal variables could be used to distinguish between levels of financial risk tolerance (objective measurement)

IV. RESEARCH METHODOLOGY

Risk tolerance, as determined by each respondent's score on the risk tolerance assessment questionnaire is used as the dependent variable.

Independent Variables: Demographic, socioeconomic and attitudinal variables

V. FINDINGS AND CONCLUSION

The investor respondent score varies significantly across different groupings of the population based on age, marital status, education level of the respondents, occupation of the respondents, number of years of work experience, income from salary/occupation, net wealth of the respondents. (For all these independent variables of age, marital status, education level of the respondents, occupation of the respondents, number of years of work experience, income from salary/occupation, net wealth of the respondents, the dependent variable varies significantly as the F ratio is very high i.e. between group variance is higher compared to within group variance and the corresponding p-value is less than 0.05).

The subjective measurement of risk tolerance and the objective measurement of the same give similar results. Therefore, risk profiling of investors based on the various economic, social, demographic and attitudinal variables is relevant and useful from the point of financial institutions and other financial service providers.

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Reliability Statistics

Cronbach's Alpha	N of Items
.567	18

ANOVA

Financial planning for how many years?

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.685	21	.175	.199	1.000
Within Groups	157.190	178	.883		
Total	160.875	199			

ANOVA

Which of the following investment do you presently own?

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	100.758	21	4.798	1.603	.053
Within Groups	532.742	178	2.993		
Total	633.500	199			

ANOVA

Which category describes your approximate net wealth?

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	32.762	21	1.560	1.943	.011
Within Groups	142.918	178	.803		
Total	175.680	199			

ANOVA

income from salary/occupation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	49.608	21	2.362	2.260	.002
Within Groups	186.072	178	1.045		
Total	235.680	199			

ANOVA

no of years of work experience

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	36.941	21	1.759	2.258	.002
Within Groups	138.639	178	.779		
Total	175.580	199			

ANOVA

number of dependents

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	27.287	21	1.299	1.600	.054
Within Groups	144.588	178	.812		
Total	171.875	199			

ANOVA

occupation

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	33.950	21	1.617	2.025	.007
Within Groups	142.130	178	.798		
Total	176.080	199			

ANOVA

highest education level

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	43.951	21	2.093	1.747	.028
Within Groups	213.244	178	1.198		
Total	257.195	199			

ANOVA

marital status

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	20.888	21	.995	2.494	.001
Within Groups	70.987	178	.399		
Total	91.875	199			

ANOVA

age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	38.994	21	1.857	3.358	.000
Within Groups	98.426	178	.553		
Total	137.420	199			

TABLES

Respondents based on gender

S. No	Particulars	No. of respondents	% of the respondents
1	Male	72	60
2	Female	48	40
	Total	120	100

Respondents based on age

S. No	Particulars	No. of respondents	% of the respondents
1	20-30	53	44.2
2	31-40	49	40.8
3	41-50	12	10
4	51-60	6	5
	Total	120	100

Respondents based on marital status

S. No	Particulars	No. of respondents	% of the respondents
1	Single	42	35
2	Married	68	56.7
3	Divorced	6	5
4	Widowed	4	3.3
	Total	120	100

Respondents based on education level

S. No	Particulars	No. of respondents	% of the respondents
1	Less than high	6	5
2	High school	21	17.5
3	Bachelor's degree	42	35
4	Master's degree	27	22.5
5	Professional degree	24	20
	Total	120	100

Respondents based on occupation

S. No	Particulars	No. of respondents	% of the respondents
1	Private employee	60	50
2	Government employee	25	20.83
3	Self employed	31	25.83
4	Retired	4	3.33
	Total	120	100

Respondents based on no. of dependants

S. No	Particulars	No. of respondents	% of the respondents
1	0-2	40	33.33
2	2-4	45	37.5
3	4-6	25	20.83
4	Above 6	10	8.33
	Total	120	100

Respondents based on experience

S. No	Particulars	No. of respondents	% of the respondents
1	Below 5	44	36.7
2	5-10	50	41.7
3	10-15	17	14.2
4	15-20	7	5.8
5	Above 20	2	1.6
	Total	120	100

Respondents based on their income from salary

S. No	Particulars	No. of respondents	% of the respondents
1	Under 25000	47	39.2
2	25000-49000	54	45
3	50000-99000	7	5.8
4	100000-149000	6	5
5	Over 200000	6	5
	Total	120	100

Respondents based on net worth

S. No	Particulars	No. of respondents	% of the respondents
1	Under 500000	48	40
2	500000-990000	37	30.83
3	1000000-1500000	25	20.83
4	Over 1500000	10	8.3
	Total	120	100

Respondents based on presently owned investment

S. No	Particulars	No. of respondents	% of the respondents
1	Life insurance	42	35
2	Savings account or CDs	33	27.5
3	Money market	12	10
4	Bonds	7	5.83
5	Stocks	7	5.83
6	Real estate	18	15
7	Others lists	1	0.83
	Total	120	100

Respondents based on their financial planning horizon (years)

S. No	Particulars	No. of respondents	% of the respondents
1	Below 3	34	28.3
2	5 years	42	35
3	10 years	29	24.2
4	15 years	15	12.5
	Total	120	100

Respondents based on their purpose of financing

S. No	Particulars	No. of respondents	% of the respondents
1	Wealth	40	33.3
2	Children education	36	30
3	Marriage	24	20
4	Post-retirement	6	5
5	Medical needs	14	11.7
	Total	120	100

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