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Financial risk tolerance: An analysis of unexplored factors

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Abstract

Using data from a survey alliance between Kiplinger's Personal Finance Magazine, PBS's Nightly Business Report, and FinaMetrica, this study explores various demographical and attitudinal factors related to financial risk tolerance. Investigating risk tolerance scores of more than 2,000 individuals immediately after the 2008 Global Financial Crisis, we find a positive relationship between risk tolerance and income, investment knowledge and positive stock market expectations. Risk tolerance is found to be lower for females, older individuals, those that currently use a financial advisor and individuals that perceive the stock market to be riskier than two years before.

JEL classification: D14; D81; D91

Keywords: Financial risk tolerance; Risk assessment; Financial planning; Financial advisors

1. Introduction

Financial risk tolerance can be defined as a comfort level that an individual is willing to accept while risking their current wealth for future growth. The basic duty of care in providing advice to individual clients is that financial advisors should be aware of the attitude and needs of their clients, including their investment objectives, investment experience, and desired financial risk tolerance levels. Understanding individual financial risk tolerance is

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particularly relevant in a post Global Financial Crisis environment where there has been increasing pressure for a higher standard of duty of care in the financial services industry.

While much research has been devoted to financial risk tolerance and various demographic factors that are related to an individual's risk preference, neither academics nor practitioners have found much more than anecdotal evidence to suggest whether financial risk tolerance is related to factors such as risk perception, stock market expectations and the use of a financial advisor. The purpose of this study, using a database of more than 2,000 respondents, is to investigate unexplored factors to better comprehend the dynamics of financial risk tolerance.

To assist financial advisors in providing a better quality service to their clients, this study addresses two questions.

1. What demographic factors are related to financial risk tolerance?
2. Are there any additional and unexplored factors related to financial risk tolerance?

2. Literature review

A number of academic studies have provided evidence of demographic and nondemographic characteristics related to the financial risk tolerance of individuals. The most common variables researched by academics to determine their relationship with financial risk tolerance are gender, age, marital status, number of dependents, income, wealth, education, and financial knowledge. We report the main findings as well as a number of less-researched variables.

Gender differences have been widely examined, with a large number of studies reporting higher financial risk tolerance for males (Grable, 2000; Grable and Joo, 2000; Bernasek and Shwiff, 2001; Chaulk, Johnson, and Bulcroft, 2003; Yook and Everett, 2003; Grable, Lytton, and O'Neill, 2004; Hallahan, Faff, and McKenzie, 2004; Yao, Hanna, and Lindamood, 2004; Fan and Xiao, 2006; Van de Venter and Michayluk, 2007; Gilliam, Chatterjee, and Zhu, 2010).

Studies have also argued that financial risk tolerance decreases with age (Xiao, Alhabeeb, Hong, and Haynes, 2000; Chaulk, Johnson, and Bulcroft, 2003; Hallahan, Faff, and McKenzie, 2004; Yao, Hanna, and Lindamood, 2004; Fan and Xiao, 2006; Van de Venter and Michayluk, 2007; Faff, Hallahan, and McKenzie, 2009). Furthermore, a nonlinear aspect to age has been observed (Hallahan, Faff, and McKenzie, 2004; Grable, Lytton, O'Neill, Joo, and Klock, 2006; Faff, Hallahan, and Mckenzie, 2009). The primary explanation for the observation of a significantly negative coefficient for age and the nonlinear relationship has been attributed to the time horizon to recover losses that is lower with age and the higher reliance on investment funds as individuals age.

Marital status has been widely studied, especially because of its interaction with age and gender. Financial risk tolerance is higher for single individuals (Grable and Joo, 2004; Hallahan, Faff, and McKenzie, 2004; Yao, Hanna, and Lindamood, 2004; Fan and Xiao, 2006). The main justification for this result is that single individuals do not hold the same responsibilities as those that are married and thus the single individuals are willing to accept

more financial risk. For example, Chaulk, Johnson, and Bulcroft (2003) propose that married individuals tend to have a lower financial risk tolerance because of a greater need for wealth protection. When gender and marital status are incorporated together, Jianakoplos and Bernasek (1998) and Bernasek and Shwiff (2001) find that single men tend to be more risk tolerant than single women. A negative relationship between financial risk tolerance and the number of dependents is identified by Chaulk, Johnson, and Bulcroft (2003) and Hallahan, Faff, and McKenzie (2004), with Faff, Hallahan, and McKenzie (2009) proposing a statistically significant nonlinear linkage. This negative relationship has been identified with marital status and may exist because of the added responsibilities and more conservative outlook to risk when dependents are considered.

Higher financial risk tolerance is reported for individuals in high income and wealth categories (Grable, 2000; Chaulk, Johnson, and Bulcroft, 2003; Yook and Everett, 2003; Chang, DeVaney, and Chiremba, 2004; Grable and Joo, 2004; Grable, Lytton, and O'Neill, 2004; Hallahan, Faff, and McKenzie, 2004; Yao, Hanna, and Lindamood, 2004; Fan and Xiao, 2006). In addition, Grable and Joo (1999) indicate a significantly positive relationship between financial risk tolerance and an individual's level of financial solvency.

A positive relationship has been identified between financial risk tolerance and education (Grable, 2000; Chang, DeVaney, and Chiremba, 2004; Grable and Joo, 2004; Hallahan, Faff, and McKenzie, 2004; Yao, Hanna, and Lindamood, 2004; Fan and Xiao, 2006). Hallahan, Faff, and Mckenzie (2004) also observe high positive correlations between income, wealth, and education, suggesting that financial risk tolerance could be a function of income and wealth rather than education.

Financial or investment knowledge has a positive relationship with financial risk tolerance (Grable, 2000; Grable and Joo, 2000, Grable and Joo, 2004; Van de Venter and Michayluk, 2007). However, Davey (2004) challenges the view that educating individual investors about financial markets and instruments will necessarily increase their financial risk tolerance. Although the financial education of an advisor's clients is considered best practice, it will most likely not have any direct influence on the risk preference of an individual as even the most knowledgeable and educated could potentially have a low financial risk tolerance.

When advising clients about investment decisions, financial advisors have to consider both their financial goals and financial risk tolerance. In many cases these two could conflict, leading advisors to recommend that individuals take on more risk than they are comfortable with to meet their financial goals. Bernasek and Shwiff (2001) report that individuals generally tend to increase the level of risk of their retirement savings after they have consulted a financial advisor. Furthermore, this increase was found to be statistically significant for both the respondent and the spouse or partner consulting a financial advisor, possibly suggesting the existence of a relationship between gender and marital status as well. In contrast to the earlier finding, Van de Venter and Michayluk (2007) find no statistically significant effect on financial risk tolerance when a financial advisor is consulted.

When examining whether a financial advisor has any impact on investment behavior, Hung and Yoong (2009) conclude that unless financial guidance is actively sought by the individual, consulting a financial advisor has no impact on investment behavior. This finding highlights the difficulty when interpreting survey questions that encompass financial advisors, and whether their advice is undertaken.

Finally, Grable (2000) reports that individuals with positive economic expectations have higher financial risk tolerance scores than those with less positive expectations, with Van de Venter and Michayluk (2007) also finding evidence that financial risk tolerance is positively related to both future expectations and previous investment performance. These previous findings identify many factors that might influence risk tolerance on their own or in combination with others.

3. Survey methodology

The data used in this study has been sourced from a United States based survey alliance undertaken by Kiplinger's Personal Finance Magazine,[1] the Public Broadcasting Service (PBS) Nightly Business Report,[2] and FinaMetrica. FinaMetrica (formerly ProQuest) is an Australian-based risk profiling company that developed a psychometric risk assessment test in cooperation with the Applied Psychology Unit of the University of New South Wales in 1997. The result is a psychometrically validated 25 question attitude test that produces a single risk tolerance score (RTS) that is standardized to a normal distribution with a mean of 50 and a standard deviation of 10. RTSs range between 0 and 100 with higher scores indicating a higher level of comfort in accepting financial risk. The FinaMetrica risk tolerance survey is a proprietary and commercially available risk tolerance measurement tool used by financial advisors. Since its launch in Australia in 1998, FinaMetrica has expanded its services to the United States in 2002 and the United Kingdom in 2004, with an international database of over 480,000 questionnaires completed to date.

Kiplinger's readers and Nightly Business Report viewers were invited to participate in three online surveys conducted between November 2009 and November 2010. Respondents were also invited to complete the online FinaMetrica risk tolerance survey for free. In addition to risk profiling, the FinaMetrica questionnaire also gathers information on basic demographic variables which allows for inferences to be made utilizing both the survey results and the individual's risk tolerance score. This study examines all three surveys with a primary focus on the results from the first survey that examines respondents' current financial circumstances, their experiences during the Global Financial Crisis and their plans and expectations for the future. The survey is reproduced in Appendix A.

Table 1 identifies the definitions and indicator variable names for the demographic factors as well as other variables that are examined in the analysis of the survey data. A Pearson correlation matrix for all of the factors in Table 1 is examined to identify any pairs of variables that may breach the ordinary least squares (OLS) assumption and cause the coefficient estimates to be biased through multicollinearity.[3] As expected, Age and Age^2 is highly correlated at 0.99. Furthermore, marital status and having a university degree is also highly correlated at 0.76. Income and combined income is also correlated, with this correlation increasing with higher levels of income, and the highest correlation being between those individually earning US$500,000 and over and those earning a combined US$500,000 or over at 0.86. This high correlation indicates that the survey respondents are most likely the main income earners and potentially also the main contributors to household financial decision making suggesting that this survey encompasses a sample relevant to financial

Table 1 Definitions and indicator variable coding for examining of factors potentially related to financial risk tolerance

Code/name	Definition
Female	Dichotomous variable that signifies a respondent is female if 1 and male if 0.
Age	Actual age in years. Age is also split into categories of 20–30 years (Age 20–30), 31–40 years (Age 31–40), 41–50 years (Age 41–50), 51–60 years (Age 51–60), 61–70 years (Age 61–70), 71–80 years (Age 71–80) and over 80 years (Age 80+).
Age^2	(Age*Age) Age has been squared to examine if any nonlinear elements exists for age when explaining financial risk tolerance.
Ed-No High Sch	Indicator variable that shows the highest completed level of education–did not complete high school.
Ed-High Sch	Indicator variable that shows the highest completed level of education–completed high school.
Ed-TradeSch	Indicator variable that shows the highest completed level of education–trade school or diploma.
Ed-University	Indicator variable that shows the highest completed level of education–university degree or higher qualification.
Income-und20	Indicator variable of the annual personal before-tax income under $20,000.
Income-20–49	Indicator variable of the annual personal before-tax income $20,000–$49,999.
Income-50–99	Indicator variable of the annual personal before-tax income $50,000–$99,999.
Income-100–199	Indicator variable of the annual personal before-tax income $100,000–$199,999.
Income-200–499	Indicator variable of the annual personal before-tax income $200,000–$499,999.
Income-500+	Indicator variable of the annual personal before-tax income $500,000 and over.
Married	Dichotomous variable that signifies a respondent is married if 1 and single if 0.
CombInc-und20	If "Yes (1)" to Married, an indicator variable of annual combined before-tax income under $20,000.
CombInc-20–49	If "Yes (1)" to Married, an indicator variable of annual combined before-tax income $20,000–$49,999.
CombInc-50–99	If "Yes (1)" to Married, an indicator variable of annual combined before-tax income $50,000–$99,999.
CombInc-100–199	If "Yes (1)" to Married, an indicator variable of annual combined before-tax income $100,000–$199,999.
CombInc-200–499	If "Yes (1)" to Married, an indicator variable of annual combined before-tax income $200,000–$499,999.
CombInc-500+	If "Yes (1)" to Married, an indicator variable of annual combined before-tax income $500,000 and over.
Dependents	Number of people whom are either fully or partially financially dependent on the respondent.
Assets-und10	Indicator variable of the combined household net assets under $10,000
Assets-10–24	Indicator variable of the combined household net assets $10,000–$24,999
Assets-25–49	Indicator variable of the combined household net assets $25,000–$49,999
Assets-50–99	Indicator variable of the combined household net assets $50,000–$99,999
Assets-100–199	Indicator variable of the combined household net assets $100,000–$199,999
Assets-200–499	Indicator variable of the combined household net assets $200,000–$499,999
Assets-500–999	Indicator variable of the combined household net assets $500,000–$999,999
Assets-1M–1.9M	Indicator variable of the combined household net assets $1,000,000–$1,999,999

Table 1 (Continued)

Code/name	Definition
Assets-2M–4.9M	Indicator variable of the combined household net assets $2,000,000–$4,999,999
Assets-5M+	Indicator variable of the combined household net assets $5,000,000 and over
Financial advisor (FA)	Dichotomous variable that signifies a respondent is currently using a Financial Advisor if 1 and 0 if no Financial Advisor is being used.
Risk perception	Indicator variable of how risky the respondent perceives the stock market to be today compared to two years ago with much riskier (MuchRiskier), somewhat riskier (SomewhatRiskier), about the same (Same), somewhat less risky (SomewhatLessRisky), and much less risky (MuchLessRisky).
Stock market Expectation	Indicator variable of the respondent's expectation of their stock market investments performance over the next twelve months with no stock market investments (NoInvest), expect to make a large loss (ExpectLargeLoss), expect to make a small loss (ExpectSmallLoss), expect to break even (ExpectBreakEven), expect to make a small profit (ExpectSmallProfit), and expect to make a large profit (ExpectLargeProfit).
Investment Knowledge	Indicator variable of the respondent's subjective level of investment knowledge with very little knowledge (KnowledgeVeryLittle), reasonable knowledge (KnowledgeReasonable), good knowledge (KnowledgeGood), and expert (KnowledgeExpert).

This table identifies the indicator variable coding for factors identified in the proceeding analysis. A definition of the category has been provided. The variables were collected through one of the three surveys in addition to the FinaMetrica risk tolerance survey. All currency figures are in US dollars.

advisors. The highly correlated variables will not appear in the same regression, with the exception of a hierarchical approach undertaken to replicate the Hallahan, Faff, and McKenzie (2004) study. Care is taken to ensure that the results are robust to single variable estimation.

For the different categories of variables, both parametric and nonparametric tests were undertaken in the form of an Analysis of Variance (ANOVA) F value and Wilcoxon rank-sum tests, respectively. These tests were undertaken to establish if each category accounts for a significant portion of the financial risk tolerance score and whether there is a statistical difference between the categories.

4. Sample characteristics

A summary of the demographic information collected in the three surveys is presented in Table 2. The three surveys were completed by 3,931 respondents, with 2,327 of these also completing the online FinaMetrica risk tolerance questionnaire. The average risk tolerance score is 56.18, which is higher than the standardized distribution that has a mean of 50. This could be attributed to the older, male dominated audience of the television series and readers of the magazine. Furthermore, because of the nature of the subject matter, respondents have an interest in financial matters and hence could be expected to have more investment knowledge than the broader US population. However, this potential sampling bias is justified as the sample is representative of the typical clientele of financial advisors, for whom this study is intended to benefit.

Table 2 Descriptive statistics of the FinaMetrica demographic dataset

Variable	Subset [mean]	Average RTS (standard deviation)	Wilcoxon (ANOVA)	Total	% of subset
Risk tolerance score	Total dataset	56.18 (10.81)		2,327	100%
Gender					
	Male	56.75 (10.49)	26.82*** (34.35***)	1,396	81.54%
	Female	52.85 (11.52)		316	18.46%
	Unidentified	56.57 (10.84)		615	
Age	[55.09 years]				
	20–30 years	59.34 (12.05)	153.73*** (24.64***)	121	5.69%
	31–40 years	60.93 (11.13)		247	11.62%
	41–50 years	59.16 (10.69)		359	16.89%
	51–60 years	55.10 (10.10)		546	25.70%
	61–70 years	53.85 (10.21)		621	29.22%
	71–80 years	53.19 (9.75)		199	9.37%
	80 years and over	52.63 (10.79)		32	1.51%
Marital status					
	Married	56.03 (10.63)	0.0083 (0.0004)	1,395	82.11%
	Single	56.02 (11.07)		304	17.89%
Number of dependents	[1.40]			1,695	
Education					
	DNC high school	62.5 (23.33)	9.57** (3.35**)	2	0.12%
	Completed high school	54.13 (11.64)		110	6.44%
	Trade/diploma	53.76 (10.99)		107	6.27%
	University degree or higher	56.33 (10.67)		1,488	87.17%
Personal before tax income	[3.39]‡		55.74*** (12.59***)	1,660	
Combined before tax income	[3.79]†		61.02*** (13.87***)	1,390	
Household net wealth	[6.84]§		31.71*** (2.51***)	1,654	
Financial advisor	Yes	55.35 (10.08)	9.02*** (7.75***)	680	30.22%
	No	56.71 (10.91)		1570	69.78%

This table summarizes the demographic characteristics and financial risk tolerance scores collected from a survey alliance between Kiplinger's Personal Finance Magazine, the PBS Nightly Business Report, and FinaMetrica. Data was collected between November 2009 and November 2010. The categories have been divided into the major demographic categories collected by FinaMetrica, with the average risk tolerance score and associated standard deviation presented for each subset. A parametric and nonparametric test was undertaken on each division to determine if each category statistically differs from the other categories, with: *significant at a level of $\alpha = 0.10$, **significant at a level of $\alpha = 0.05$, and ***significant at a level of $\alpha = 0.01$. The total number of observations for each subset and percentage of the total are also presented.

‡Measured on a scale between 1 and 5, where 1 is under $20,000 and 5 is $500,000 or over; more information in Table 2.

§Measured on a scale between 1 and 10, where 1 is under $10,000 and 10 is $5,000,000 or over; more information in Table 2.

Table 2 illustrates that survey respondents are predominately male (81.54%) with an average age of approximately 55 years. Age ranges between 20 and 86 years, with the highest age brackets present in the study between 61 and 70 years, which constitutes approximately

29% of the sample. Married individuals (82.11%) represent a higher proportion of the database, as well as the majority of individuals that have completed a university degree or higher (87.17%). Personal and combined before tax income have averages of 3.39 and 3.79, respectively, indicating a mean income in the US$50,000 to US$99,999 range. Furthermore, household net wealth has an average of 6.84, implying that average survey participants fall into the upper scale of the US$200,000 to US$499,999 net asset range. The services of financial advisors are used by approximately 30% of respondents.

When examining the average risk tolerance scores, males are more risk tolerant than is statistically significant with the parametric and nonparametric tests significant at the 1% level. Average financial risk tolerance is lower for older respondents with each category being statistically different at the 1% level. Those individuals that have attained a university degree or higher have a higher average financial risk tolerance compared to those that have attained lower levels of education.

Table 2 illustrates that there is no statistically significant difference in financial risk tolerance scores when considering marital status, despite the academic literature arguing that single individuals are more risk tolerant. The high proportion of married individuals (82.11%) may account for this inconsistency with prior research. Although not shown in Table 2, higher levels of personal and combined before tax income are associated with higher financial risk tolerance scores. This relationship also exists for net assets. However, Hallahan, Faff, and McKenzie (2004) identify high positive correlations between income, wealth, and education, suggesting that financial risk tolerance could be a function of income and wealth rather than education. There is a statistically significant difference in financial risk tolerance between those that currently use a financial advisor and those that do not, with those that have a lower average risk tolerance score.

5. Analysis of results

5.1. Demographic factors related to financial risk tolerance

We undertake an analysis of how various demographic factors relate to financial risk tolerance using a hierarchical regression analysis similar to the approach of Hallahan, Faff, and McKenzie (2004). As with our study, Hallahan, Faff, and McKenzie (2004) used the FinaMetrica risk tolerance assessment test to survey respondents. Although both studies used the same financial risk tolerance assessment, a number of key differences exist between the studies. Most notably, Hallahan, Faff, and McKenzie (2004) sampled over 20,000 Australians between 1999 and 2002. Our study is US based, with a sample size of just over 2,000 and was conducted approximately a decade later (2009–2010). In addition, a number of demographic differences are evident between the two samples. For example, in the Hallahan, Faff, and McKenzie (2004) sample, 70.75% are male, 14.65% are over 60 years old, and 50.13% have a university degree. In our sample 81.54% are male, 40.10% are over 60 years old and 87.17% have a university degree. It is therefore possible that any differences in findings may be attributable to these differences.

Table 3 Hierarchical regression of demographic factors on financial risk tolerance

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Intercept (α_0)	72.43***	73.84***	74.03***	74.30***	74.42***	75.33***	75.92***
	(3.27)	(3.22)	(3.22)	(4.88)	(4.92)	(4.93)	(5.21)
Age	−0.437***	−0.408***	−0.425***	−0.433***	−0.55***	−0.57***	−0.62***
	(0.128)	(0.126)	(0.127)	(0.127)	(0.127)	(0.128)	(0.14)
Age^2	0.002*	0.002	0.002	0.002	0.003**	0.003***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
NDEP	0.645***	0.328	0.294	0.295	0.099	0.128	0.143
	(0.206)	(0.208)	(0.230)	(0.230)	(0.230)	(0.230)	(0.231)
DFEM		−4.85***	−4.73***	−4.67***	−3.93***	−4.08***	−4.14***
		(0.67)	(0.67)	(0.67)	(0.68)	(0.68)	(0.68)
DMARRIED			0.402	0.362	−0.002	−1.37	−1.14
			(0.752)	(0.753)	(0.748)	(1.43)	(1.46)
Ed-HighSch				−0.953	−0.01	−0.258	−0.417
				(3.73)	(3.70)	(3.71)	(3.72)
Ed-TradeSch				−1.07	0.118	−0.165	−0.412
				(3.73)	(3.71)	(3.71)	(3.72)
Ed-University				−0.013	0.24	−0.094	−0.210
				(3.61)	(3.58)	(3.58)	(3.59)
Income- 20–49					1.11	0.79	0.330
					(1.27)	(1.38)	(1.42)
Income- 50–99					1.68	1.52	0.937
					(1.14)	(1.28)	(1.34)
Income- 100–199					3.99***	2.84**	2.49*
					(1.18)	(1.36)	(1.43)
Income- 200–499					5.85***	3.44**	3.31*
					(1.34)	(1.71)	(1.77)
Income- 500+					7.70***	2.68	2.55
					(2.42)	(4.44)	(4.52)
CombIn- 20–49						1.96	1.49
						(1.77)	(1.80)
CombIn- 50–99						0.397	0.151
						(1.44)	(1.48)
CombIn- 100–199						1.90	1.60
						(1.47)	(1.51)
CombIn- 200–499						3.42**	3.25*
						(1.72)	(1.77)
CombIn- 500+						6.14	6.07
						(4.12)	(4.15)
Assets- 10–24							−1.77
							(2.54)
Assets- 35–49							−0.998
							(2.39)
Assets- 50–99							2.28
							(1.70)
Assets- 100–199							2.47
							(1.57)
Assets- 200–499							1.50
							(1.40)
Assets- 500–999							1.25
							(1.41)

Table 3 (Continued)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Assets- 1M-1.9M							1.47
							(1.43)
Assets- 2M-4.9M							−0.31
							(1.54)
Assets- 5M+							1.54
							(2.18)
Number of observations	1,689	1,687	1,680	1,680	1,680	1,680	1,680
R^2	0.0807	0.1092	0.1093	0.1102	0.1322	0.1368	0.1427
Adjusted R^2	0.0791	0.1071	0.1066	0.1059	0.1254	0.1274	0.1287
F-Statistic	49.33***	51.53***	41.07***	25.87***	19.52***	14.62***	10.19***

This table presents the demographic factors collected in the FinaMetrica survey regressed on the financial risk tolerance score in order to examine the impact demographic characteristics have on determining an individual's financial risk tolerance. The approach was undertaken to compare to the Hallahan, Faff, and McKenzie (2004) study and their hierarchical regression results, as well as the wider literature. An approach to continually add more variables was used to establish whether all of the demographic variables improve the explanatory power of the model. Table 1 provides more information on the indicator variable coding and definitions included within the regression. The estimated coefficients from the regression and F-statistic are presented with *significant at a level of $\alpha = 0.10$, **significant at a level of $\alpha = 0.05$, and ***significant at a level of $\alpha = 0.01$. The standard error of each variable is shown in brackets below the coefficient.

This table presents the estimated regression output of Model 7 for the equation:

$$RTS_i = \alpha_0 + \alpha_1 AGE_i + \alpha_2 AGI_i^2 + \alpha_3 NDEP_i + \alpha_4 D_{i,FEM} + \alpha_5 D_{i,MARRIED} + \sum_{g=EDU_2}^{EDU_4} \alpha_g D_{i,g} + \sum_{h=INC_2}^{INC_6} \alpha_h D_{i,h} + \sum_{j=CINC_2}^{CINC_6} \alpha_j D_{i,j} + \sum_{k=NASS_2}^{NASS_{10}} \alpha_k D_{i,k} + \varepsilon_i$$

Table 3 reports the results of seven regression models that progressively add sets of demographic indicator variables. Although the same FinaMetrica risk tolerance measure is used, the indicator variable categories for income, combined income, and net assets differ slightly from Hallahan, Faff, and McKenzie (2004) with more categories used in this study. When examining the adjusted R^2 as more variables are added to explain financial risk tolerance, the addition of the gender variable leads to an improvement in the model. However, the addition of the marital status and education indicator variables causes a slight decrease in the explanatory power of the model. The addition of income, combined income, and net assets lead to improvements in the model when examining adjusted R^2. When comparing the variables and R^2 values to Hallahan, Faff, and McKenzie (2004), the adjusted R^2 figures in this study are smaller than their results; however, the same general pattern exists. Unlike their study, we do not find an increase in the explanatory power of the model once the education indicator variables are included. This can be attributed to the difference in sample characteristics. In our study 87.17% of respondents have a university degree, compared to 50.13% in the Hallahan, Faff, and McKenzie (2004) study.

Table 3 shows consistency in the statistically significant variable coefficients across the different models. Age and female are both negative and statistically significant. Model 5

encompasses the addition of personal before-tax income indicator variables, with all three categories over US$100,000 positive and significant at the 1% level indicating statistical increases in risk tolerance for higher income individuals. The addition of the income indicator variables also causes the nonlinear Age^2 term to become significant at the 5% level, albeit with a very small coefficient.

When combined income is included in Model 6, the US$500,000 and over coefficient becomes insignificant and the two income categories between US$100,000 and US$499,999 have smaller positive coefficients that are only significant at the 5% level. Furthermore, the fifth combined income category (US$200,000 to US$499,999) has a positive coefficient that is statistically significant at the 5% level and Age^2 become significant at the 1% level. The correlation matrix indicates a high correlation between income and combined income that may have led to the additional coefficients incorporating the significance in explaining financial risk tolerance. The addition of net assets in Model 7 causes a further decrease in the statistical significance of the remaining two personal income categories between US$100,000 and US$499,999 and the US$200,000 to US$499,999 combined income category to the 10% level. Overall, gender and age remained statistically significant at the 1% level throughout all seven models. Similarly, Age^2 became significant after the inclusion of income and becomes even more significant at lower levels after adding combined income and net assets.

Table 3 reports that Model 7 is the base case scenario of a respondent that has a financial risk tolerance of 75.92, is a single male that did not complete high school, has an annual income before tax of under US$20,000 and net assets of under US$10,000. This baseline is substantially higher than the Hallahan, Faff, and McKenzie (2004) study who find an intercept of 62.39 for the financial risk tolerance of an Australian single male that did not complete high school, has an annual income before tax of less than $30,000 (AUD) and net assets less than $50,000 (AUD).

Our findings are consistent with the academic literature that finds that females have a lower financial risk tolerance. Table 3 Model 7 reports a −4.14 coefficient on the female indicator variable that is significant at the 1% level. When individuals age, their financial risk tolerance score declines by −0.62 per year. Furthermore, a significant nonlinear effect in age is also identified with a marginally positive coefficient 0.004 indicating that financial risk tolerance decreases at a decreasing rate as age increases, but this level is extremely low and is not statistically significant. This finding is in contrast to Hallahan, Faff, and McKenzie (2004) who observe a statistically significant negative Age^2 coefficient and conclude that financial risk tolerance declines at an increasing rate as age increases.

When comparing the results with the demographic factors included in Model 7, besides the aforementioned variables and the indicator variables for income of US$100,000 to US$499,999 and combined income of US$100,000 to US$199,999 that are significant at the 10% level, all the other coefficients are statistically insignificant. Therefore, the results presented in Model 7 contradict majority number of statistically significant coefficients in the Hallahan, Faff, and McKenzie (2004) article. In the next section we explore additional factors related to risk tolerance, including risk perception around the time of the Global Financial Crises.

5.2 Additional factors related to financial risk tolerance

Table 4 provides a summary of the average risk tolerance scores divided into the different risk perception categories (how risky respondents perceive the stock market to be today compared to two years ago) by gender, use of a financial advisor and investment knowledge. This summary is used to examine whether any of the risk perception categories are represented by a specific subset of the population. This test is important to identify before any regressions are estimated to identify the characteristics of the data and establish if any inherent differences exist in certain subsets of the population.

Panel A in Table 4 indicates that males that perceive the stock market to be riskier today compared to two years ago have lower average risk tolerance scores than those that identify stock market risk to be either the same or less risky. This relationship seems intuitive when interpreting financial risk tolerance as a comfort level for taking risk. If an individual perceives the stock market to be less risky then, ceteris paribus, it is possible that they may be comfortable with a higher level of financial risk tolerance. Panel A.1 shows that both those that use and do not use a financial advisor exhibit these characteristics with significant differences across the five risk perception categories using both parametric and nonparametric tests. Further, all males (whether using or not using a financial advisor) tend to perceive the stock market as about the same level of risk as two years ago with total percentages of 38.38% and 41.01% respectively. In addition, only those males that believe the current market is much less risky today compared to two years ago and who are not currently using a financial advisor, have a statistically higher financial risk tolerance.

When examining investment knowledge in Panel A.2, only reasonable and good levels of knowledge have statistically different categories of financial risk tolerance for risk perception. Those males with reasonable and good investment knowledge levels perceive the stock market as about the same level of risk as two years ago. Again, those categories tend to exhibit higher average levels of risk tolerance scores for those that perceive the stock market to be less risky than two years ago. In addition, higher levels of investment knowledge are associated with higher levels of average risk tolerance scores with statistically significant differences identified for all of the perception levels for males.

Panel B in Table 4 reports that females exhibit similar characteristics in regard to higher levels of average risk tolerance scores for lower levels of perceived risk in the stock market. Panel B.1 indicates that females that do not use a financial advisor exhibit higher levels of financial risk tolerance as less risk is perceived in the stock market. Therefore, 41.30% of females that do not use a financial advisor indicated that they perceive the stock market to be at the same level of risk today as two years ago. For females that use a financial advisor, parametric and nonparametric tests indicate differences in the risk perception categories at the 10% level. Higher average risk tolerance scores are observed for those females that perceive the stock market to be 'somewhat less risky,' however, the nonparametric test is insignificant.

Panel B.2 reports that 'very little' and 'reasonable' levels of investment knowledge are statistically significant. Males exhibit higher levels of subjective investment knowledge than females, with 50.55% of females stating a reasonable level of investment knowledge as opposed to 48.71% of males stating a good level of investment knowledge. Females with a

Table 4 Risk tolerance scores for the levels of risk perception split into gender, use of a financial advisor and investment knowledge

	Total	Risk perception					
		Much riskier	Somewhat riskier	Same	Somewhat less risky	Much less risky	Wilcoxon (ANOVA)
A. Male							
A.1 Financial advisor							
Financial advisor "Yes"							
Average RTS	55.93	50.44	54.07	57.26	56.99	57.50	15.07***
N (% of total)	396 (30.39%)	32 (8.08%)	89 (22.47%)	152 (38.38%)	109 (27.53%)	14 (3.54%)	(4.58***)
Financial advisor "No"							
Average RTS	56.71	52.08	56.03	57.22	56.03	64.44	41.93***
N (% of total)	907 (69.61%)	59 (6.50%)	214 (23.59%)	372 (41.01%)	214 (23.59%)	48 (5.29%)	(10.35***)
Wilcoxon (ANOVA)	2.88 (1.59)	0.25 (0.42)	1.53 (2.03)	0.01 (0.00)	1.35 (0.62)	3.44* (5.11**)	
A.2 Investment knowledge							
Very little							
Average RTS	51.53	54.67	49.25	52.92	52.69	27.00	5.01
N (% of total)	45 (3.31%)	6 (13.33%)	12 (26.67%)	13 (28.89%)	13 (28.89%)	1 (2.22%)	(1.24)
Reasonable							
Average RTS	54.73	48.66	53.76	55.42	55.67	63.76	31.44***
N (% of total)	550 (40.47%)	47 (8.55%)	140 (25.45%)	220 (40.00%)	126 (22.91%)	17 (3.10%)	(9.79***)
Good							
Average RTS	58.16	52.13	56.70	58.50	58.83	63.16	22.56***
N (% of total)	662 (48.71%)	32 (4.83%)	131 (19.79%)	261 (39.43%)	206 (31.12%)	32 (4.83%)	(5.84***)
Expert							
Average RTS	61.75	67.33	62.95	61.43	59.69	63.83	2.54
N (% of total)	102 (7.51%)	6 (5.88%)	19 (18.63%)	30 (29.41%)	35 (34.31%)	12 (11.76%)	(0.90)
Wilcoxon (ANOVA)	32.54***	9.59**	15.95***	20.22***	10.79***	3.05	
	(9.98***)	(3.51**)	(6.27***)	(7.55***)	(3.99***)	(4.77***)	
B. Female							
B.1 Financial advisor							
Financial advisor "Yes"							
Average RTS	53.01	46.00	52.38	55.08	52.38	63.50	8.10*
N (% of total)	107 (36.77%)	9 (8.41%)	29 (27.10%)	38 (35.51%)	29 (27.10%)	2 (1.87%)	(2.10*)
Financial advisor "No"							
Average RTS	53.53	44.15	49.95	55.95	56.43	61.00	24.86***
N (% of total)	184 (63.23%)	20 (10.87%)	41 (22.28%)	76 (41.30%)	44 (23.91%)	3 (1.63%)	(7.38***)
Wilcoxon (ANOVA)	0.96 (0.78)	0.81 (0.20)	0.98 (0.85)	0.50 (0.17)	1.90 (2.90*)	0.33 (0.26)	

Table 4 (Continued)

	Total	Risk perception					
		Much riskier	Somewhat riskier	Same	Somewhat less risky	Much less risky	Wilcoxon (ANOVA)
B.2 Investment knowledge							
Very little							
Average RTS	46.43	38.92	51.67	50.50	44.57	61.00	11.10**
N (% of total)	42 (15.27%)	13 (30.95%)	9 (21.43%)	12 (28.57%)	7 (16.67%)	1 (2.38%)	(3.34**)
Reasonable							
Average RTS	53.03	49.00	47.56	55.63	55.52	58.00	14.65***
N (% of total)	139 (50.55%)	13 (9.35%)	34 (24.46%)	62 (44.60%)	29 (20.86%)	1 (0.72%)	(4.10***)
Good							
Average RTS	56.43	50.50	54.48	56.77	58.20	62.50	5.08
N (% of total)	88 (32.00%)	2 (2.27%)	25 (28.41%)	39 (44.32%)	20 (22.73%)	2 (2.27%)	(0.97)
Expert							
Average RTS	60.17	53.00	61.50	66.00	59.50	—	1.29
N (% of total)	6 (2.18%)	1 (16.67%)	2 (33.33%)	1 (16.67%)	2 (33.33%)	—	(0.27)
Wilcoxon (ANOVA)	11.32***	9.59**	7.66**	4.46 (1.44)	8.12**	0.30 (0.11)	
	(5.93***)	(3.20**)	(2.83**)		(4.16***)		

The average risk tolerance scores are presented for the panels split by gender, use of a financial advisor and subjective investment knowledge. A parametric and non-parametric test has been undertaken on the average RTS for the risk perception categories and panel categories in order to verify that each category accounts for a significant portion of financial risk tolerance and that it statistically differs from the other categories, with *significant at a level of $\alpha = 0.10$, **significant at a level of $\alpha = 0.05$, and ***significant at a level of $\alpha = 0.01$. Further explanations of the variables are presented in Table 1. Note these survey questions were only asked in Surveys 1 and 2.

reasonable level of investment knowledge exhibit higher average risk tolerance scores with lower levels of risk perceived in the market. Only females that perceive the market to be the same or much less risky today compared to two years ago have no significant differences between the investment knowledge categories, with all of the other categories having statistically different average risk tolerance scores between investment knowledge and use of a financial advisor. A similar relationship exists for males and females with higher levels of investment knowledge associated with higher average risk tolerance scores.

To complement the examination of risk perception, an analysis of the expectation of future stock market performance is also undertaken. Table 5 presents a summary of the average risk tolerance scores divided into the same categories as Table 4. Panel A of Table 5 reports the expected future stock market performance for males based on the use of a financial advisor and level of self-reported investment knowledge. Panel A.1 indicates significant differences in expected stock market performance between males that use and do not use a financial advisor. For both categories, there is a higher level of average risk tolerance scores for more positive expectations. Intuitively, this is interpreted as indicating that males that expect to make a profit are comfortable with taking more risk as opposed to those males that do not expect to make any profit. Over 80% of males in the sample expect to make a small profit over the next 12 months. There are no statistically different risk tolerance scores identified between males that use and do not use a financial advisor when examining expectations of future stock market performance.

Panel A.2 in Table 5 divides males into investment knowledge categories, with reasonable and 'good' levels of knowledge statistically different for the expected performance categories. For both reasonable and good levels of investment knowledge over 80% expect to make a small profit. In addition, generally higher levels of expected performance exhibit higher average risk tolerance scores. When considering investment knowledge split into expectations, all categories except 'no invest,' 'large loss,' and 'break even' statistically differ when considering average risk tolerance scores.

Panel B in Table 5 splits expected stock market performance into females that use a financial advisor and different levels of investment knowledge. Panel B.1 indicates a similar relationship for females that do not use a financial advisor with higher levels of average risk tolerance associated with higher expected performance. Females using a financial advisor have significant parametric differences and exhibit a similar relation as those females not using a financial advisor. Over 70% of females that either use or do not use a financial advisor expect to make a small profit over the next 12 months. None of the average risk tolerance scores statistically differ for the expected future profit categories of females that use and do not use a financial advisor. Panel B.2 shows females, divided into investment knowledge categories with 'very little,' reasonable, and good levels of self-reported financial knowledge, have significantly different expectations of future performance. All of these categories have over 70% of females expecting to make a small profit over the next 12 months. Similarly, higher average risk tolerance scores are associated with higher expected future stock market performance. Only break even and small profit expectation categories statistically differ for average risk tolerance scores when considering the investment knowledge levels. The category for expecting a large loss in Table 5 only has one observation and hence is excluded from further analysis.

Table 5 Risk tolerance scores for the different expectations of stock market performance split into gender, use of a financial advisor and investment knowledge

		Stock market expectation						
	Total	No invest	Large loss	Small loss	Break even	Small profit	Large profit	Wilcoxon (ANOVA)
A. Male								
A.1 Financial Advisor								
Financial advisor "Yes"								
Average RTS	56.26	—	43.00	50.67	49.67	56.40	62.72	16.10***
N (% of total)	258 (30.00%)	—	1 (0.39%)	6 (2.33%)	15 (5.81%)	218 (84.50%)	18 (6.98%)	(4.96***)
Financial advisor "No"								
Average RTS	56.47	41.44	—	52.25	54.60	56.59	65.55	46.52***
N (% of total)	602 (70.00%)	18 (2.99%)	—	16 (2.66%)	45 (7.48%)	483 (80.23%)	40 (6.64%)	(18.31***)
Wilcoxon (ANOVA)	0.44 (0.29)	—	—	0.16 (0.06)	1.10 (2.07)	0.05 (0.06)	1.07 (0.96)	
A.2 Investment knowledge								
Very little								
Average RTS	51.48	53.00	—	28.00	46.50	53.43	53.00	4.67
N (% of total)	21 (2.44%)	2 (9.52%)	—	1 (4.77%)	2 (9.52%)	14 (66.67%)	2 (9.52%)	(1.63)
Reasonable								
Average RTS	54.60	41.64	—	48.09	51.75	55.10	61.33	26.18***
N (% of total)	373 (43.37%)	11 (2.95%)	—	11 (2.95%)	28 (7.51%)	302 (80.97%)	21 (5.63%)	(10.14***)
Good								
Average RTS	57.78	43.00	43.00	58.30	55.36	57.27	67.29	31.96***
N (% of total)	412 (47.91%)	3 (0.73%)	1 (0.24%)	10 (2.43%)	28 (6.80%)	339 (82.28%)	31 (7.52%)	(7.81***)
Expert								
Average RTS	60.89	47.50	—	—	61.67	61.27	62.75	2.93
N (% of total)	54 (6.28%)	2 (3.70%)	—	—	3 (5.56%)	45 (83.33%)	4 (7.41%)	(1.12)
Wilcoxon (ANOVA)	18.23*** (8.11***)	0.92 (0.38)	—	5.81** (4.78***)	5.71 (1.15)	17.24*** (7.05***)	7.58** (2.77**)	

Table 5 (Continued)

	Total	Stock market expectation						
		No invest	Large loss	Small loss	Break even	Small profit	Large profit	Wilcoxon (ANOVA)
B. Female								
B.1 Financial advisor								
Financial advisor "Yes"								
Average RTS	53.20	51.00	—	44.00	54.50	52.56	68.25	6.74
N (% of total)	46 (31.72%)	2 (4.35%)	—	4 (8.70%)	2 (4.35%)	34 (73.91%)	4 (8.70%)	(2.93**)
Financial advisor "No"								
Average RTS	53.75	40.33	—	30.50	48.93	55.14	63.33	16.25***
N (% of total)	99 (68.28%)	3 (3.03%)	—	2 (2.02%)	15 (15.15%)	73 (73.74%)	6 (6.06%)	(6.42***)
Wilcoxon (ANOVA)	0.32 (0.91)	0.33 (0.51)	—	1.93 (2.28)	0.27 (0.41)	1.44 (1.62)	0.93 (0.48)	
B.2 Investment knowledge								
Very little								
Average RTS	50.77	64.00	—	27.00	32.00	53.38	65.00	9.66**
N (% of total)	18 (12.50%)	1 (5.56%)	—	1 (5.56%)	2 (11.11%)	13 (72.22%)	1 (5.56%)	(6.97***)
Reasonable								
Average RTS	52.15	37.33	—	38.00	54.89	52.39	68.33	10.50**
N (% of total)	75 (52.08%)	3 (4.00%)	—	3 (4.00%)	9 (12.00%)	57 (76.00%)	3 (4.00%)	(4.42***)
Good								
Average RTS	56.19	47.00	—	48.00	46.60	57.03	63.83	12.99***
N (% of total)	47 (32.64%)	1 (2.13%)	—	2 (4.26%)	5 (10.64%)	33 (70.21%)	6 (12.77%)	(3.86***)
Expert								
Average RTS	62.5	—	—	—	—	62.50	—	—
N (% of total)	4 (2.78%)	—	—	—	—	4 (100%)	—	
Wilcoxon (ANOVA)	8.89** (6.92**)	2.13 (1.38)	—	3.10 (1.27)	6.47** (5.31**)	8.00** (2.68**)	0.62 (0.14)	

The average Risk Tolerance Scores are presented for the panels split by gender, use of a Financial Advisor and subjective investment knowledge. A parametric and non-parametric test has been undertaken on the average RTS for the Expected performance categories and panel categories in order to verify that each category accounts for a significant portion of Financial Risk Tolerance and that it statistically differs from the other categories, with *significant at a level of $\alpha = 0.10$, **significant at a level of $\alpha = 0.05$, and ***significant at a level of $\alpha = 0.01$. Further explanations of the variables are presented in Table 1. Note these survey questions were only asked in Surveys 1 and 2.

Table 6 presents the output of estimating the base regression of explanatory variables previously identified with the inclusion of indicator variables representing the level of investment knowledge, risk perception and the expectation of stock market performance. Furthermore, interaction variables for risk perception and expected stock market performance are included to examine if differences exist between males and females and the use of a financial advisor.

The results in Table 6 present a base case of a male that does not use a financial advisor, is aged 20–30 years, earns under US$20,000 per year, has very little investment knowledge, perceives the riskiness of the stock market to be about the same today as two years ago and do not have any stock market investments. This individual has a risk tolerance of 55.86 as shown by the intercept. Use of a financial advisor is not statistically significant regarding their financial risk tolerance. Higher levels of age decrease financial risk tolerance. Interestingly, a male aged between 61 to 80 years has lower estimated financial risk tolerance than a male aged over 80 years. However, when examining the Wald test, these results are not statistically different in relation to financial risk tolerance. An interesting result is that being female does not significantly decrease financial risk tolerance on the base regression. Similar to the previous results, higher levels of income are associated with higher levels of financial risk tolerance, with the Wald test indicating significance between the categories at the 10% level. In addition, higher levels of investment knowledge are associated with higher levels of financial risk tolerance for the base individual.

When examining whether risk perception is related to financial risk tolerance, a number of interesting results are identified. First, individuals who believe market risk today is much higher than two years ago have an estimated decline in financial risk tolerance by −4.01 and those individuals who believe it is much less risky today have an estimated 4.63 increase in financial risk tolerance. None of the interaction variables with using a financial advisor are significant. However, the interaction between female and perceiving the stock market to be somewhat riskier today compared to two years ago decreases estimated financial risk tolerance by −3.33 at the 5% level. When examining the results for expected stock market performance over the next 12 months, the expectation of a large profit statistically increases estimated financial risk tolerance by 6.10 at the 1% level. The expectation to break even decreases financial risk tolerance by −2.45 at the 10% level. All of the other indicator variables and interactions are statistically insignificant.

The results in Table 6 present a number of interesting findings. Although there are statistical differences between the age indicator variables, those aged over 60 do not have a statistically different relation to financial risk tolerance. Furthermore, there is no significant gender indicator variable found in the previous regression when explaining financial risk tolerance. Higher levels of investment knowledge are found to be associated with higher levels of financial risk tolerance that is consistent with the academic literature. Risk perception is significant for higher and lower levels of perceived risk with those believing it is much less riskier and those believing it is much more riskier today compared to two years ago both being significant at the 1% level. In addition, an interaction effect exists for the much riskier group and females that is associated with a decrease in financial risk tolerance.

The expectation of stock market performance over the subsequent 12 months only has a

Table 6 Regression of risk perception and stock market expectation on financial risk tolerance

Variable	Coefficient	Standard error	*t* statistic
Intercept α_0	55.86	1.73	32.34***
FP	−0.18	1.05	−0.17
Age 31–40	−3.09	1.25	−2.45***
Age 41–50	−3.63	1.20	−3.02***
Age 51–60	−8.58	1.14	−7.50***
Age 61–70	−9.90	1.13	−8.78***
Age 71–80	−10.16	1.27	−8.01***
Age over 80	−9.18	2.05	−4.49***
Female	−1.68	1.17	−1.43
Income-20–49	1.06	1.19	0.89
Income-50–99	1.20	1.05	1.14
Income-100–199	3.05	1.07	2.84***
Income-200–499	4.63	1.23	3.77***
Income-500+	5.84	2.24	2.60***
Knowledge Reasonable	5.00	1.06	4.72***
Knowledge Good	7.66	1.07	7.15***
Knowledge Expert	8.50	1.38	6.15***
Much Riskier	−4.01	1.27	−3.15***
Much Less Risky	4.63	1.43	3.23***
Somewhat Riskier	−0.99	0.78	−1.27
Somewhat Less Risky	0.62	0.73	0.85
FA * Much Riskier	−1.61	2.03	−0.80
FA * Much Less Risky	−4.27	2.84	−1.51
FA * Somewhat Riskier	−0.12	1.34	−0.09
FA * Somewhat Less Risky	−1.40	1.29	−1.08
DFEM * Much Riskier	−1.13	2.33	−0.49
DFEM * Much Less Risky	3.10	4.51	0.69
DFEM * Somewhat Riskier	−3.33	1.58	−2.11**
DFEM * Somewhat Less Risky	−0.11	1.64	−0.07
Expect Small Loss	−3.36	2.33	−1.44
Expect Break Even	−2.45	1.45	−1.69*
Expect Small Profit	−0.17	0.63	−0.27
Expect Large Profit	6.10	1.53	3.98***
FA * Expect Small Loss	2.51	4.09	0.61
FA * Expect Break Even	−1.34	2.74	−0.49
FA * Expect Small Profit	1.15	1.08	1.06
FA * Expect Large Profit	0.99	2.59	0.38
DFEM * Expect Small Loss	−5.99	4.85	−1.24
DFEM * Expect Break Even	1.13	2.79	0.41
DFEM * Expect Small Profit	0.76	1.34	0.57
DFEM * Expect Large Profit	4.24	3.36	1.26
Number of Observations	1644		
R^2	0.2428		
Adjusted R^2	0.2239		
F-Statistic	12.85***		

significant increase on financial risk tolerance for an expected large profit and a significant decrease for an expecting to break even. This finding is consistent with the literature indicating that positive expectations are related to higher levels of financial risk tolerance. However, no other variables have been identified as being statistically significant.

Table 6 (Continued)

Wald Tests of Coefficient Equality:	
(Age 31–40 = Age 41–50 = Age 51–60 = Age 61–70 = Age 71–80 = Age 80 over)	*P*-value = 0.00***
(Age 31–40 = Age 41–50)	*P*-value = 0.57
(Age 41–50 = Age 51–60)	*P*-value = 0.00***
(Age 51–60 = Age 61–70)	*P*-value = 0.04**
(Age 61–70 = Age 71–80)	*P*-value = 0.76
(Age 71–80 = Age 80 over)	*P*-value = 0.61
(Age 61–70 = Age 71–80 = Age 80 over)	*P*-value = 0.87
(Income 100–199 =Income 200–499 =Income 500+)	*P*-value = 0.08*
(Knowledge Reasonable = Knowledge Good = Knowledge Expert)	*P*-value = 0.01***

This table presents results for examining whether risk perception or expectations for future stock market profit are related to financial risk tolerance. Interaction variables are included to examine whether this relation differs for those using a financial advisor or for differences in gender. Further explanations of the variables are presented in Table 1. The estimated coefficients, standard errors, and *t* statistics from the regression as well as the *F*-statistic are presented with *significant at a level of $\alpha = 0.10$, **significant at a level of $\alpha = 0.05$, and ***significant at a level of $\alpha = 0.01$. A Wald test of coefficient equality was undertaken on a number of parameters.

6. Summary and conclusion

Using the same methodology as the Australian study of Hallahan, Faff, and McKenzie (2004), we identify demographic factors that are related to financial risk tolerance. Although our study has a smaller sample size, it is United States based and conducted approximately a decade later. There is a statistically significant positive relationship between financial risk tolerance and income, while financial risk tolerance is lower for females and older individuals. In contrast to other academic studies, we find no significant relationship between financial risk tolerance and marital status, education, or wealth.

We explored the emotional constructs of risk perception and stock market expectations and investigated if these constructs are related to financial risk tolerance. The use of a financial advisor, gender, and investment knowledge are all incorporated in the analysis. Individuals that perceive the stock market to be riskier today compared to two years ago have lower average risk tolerance scores. Higher financial risk tolerance scores were found for individuals with positive future stock market performance expectations. While males exhibit higher levels of subjective investment knowledge compared to females, for both genders higher levels of investment knowledge are associated with higher levels of financial risk tolerance. Financial risk tolerance is lower for those individuals that currently use a financial advisor.

These findings are relevant for the Financial Services Industry when considering the increasing pressure for a higher duty of care placed on financial advisors. Furthermore, individual biases may be transferred by the financial advisor to the client and this may influence the level of financial risk tolerance and subsequent economic exposure that results from the financial advice. Therefore, it is vital that financial advisors understand the effect that their services have on the financial risk tolerance of potential clients. As a result, this understanding will enable financial advisors to provide personally informed advice without unnecessarily exposing themselves to professional liability.

Notes

1 Kiplinger's Personal Finance Magazine was founded in 1947 and is a monthly publication that provides advice to readers on personal finance and investment matters.
2 The Public Broadcasting Service (PBS) was founded in 1970 and is an US public broadcasting television network that broadcasts the Nightly Business Report.
3 The complete correlation matrix table is available upon request.

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Appendix

The complete Kiplinger public survey is reproduced below.

1 Are you involved in the management of your investments?
Yes.
No.

2 If Yes to Q1, how often do you look at your investments?
Daily.
Weekly.
Monthly.
Quarterly.
Half-Yearly.
Yearly.
Less Frequently.

3 Do you use a financial/investment advisor?
Yes.
No.

4 Were you using an advisor two years ago?
Yes.
No.

5 If Yes to both Q3 and Q4, is it the same advisor?
Yes.
No.

6 How knowledgeable are you about investing?
I have very little knowledge.
I have reasonable knowledge.
I have good knowledge.
I am an expert.

7 Do you have a retirement savings plan and, if so, what type(s) of plan? (tick all that apply)
I do not have a retirement savings plan.
401a (pension and defined contribution).
401k.
403b (educational, religious, hospital and non-profit).
457 (government and tax-exempt institutions).

8 **How have your investments (including 401k, 403b and 457) performed over the past two years?**
I do not have any significant investments.
I have made a big loss.
I have made some loss.
I have broken even.
I have made some profit.
I have made a big profit.

9 **How did this performance compare with your expectations**
I do not have any significant investments.
Much worse.
Somewhat worse.
In line with expectations.
Somewhat better.
Much better.

10 **What did you do with regard to your stock market investments in the 2008/9 market decline?**
I did not have any significant stock market investments.
I kept all my stock market investments.
I sold some of my stock market investments and reinvested in the stock market.
I sold some of my stock market investments and did not re-invest.
I sold most of my stock market investments and did not re-invest.
I sold all my stock market investments and did not re-invest.

11 **To what extent has the 2008/9 stock market decline affected your ability to achieve your long term financial goals?**
I do not have any long term financial goals.
My long-term financial goals are not affected.
My long-term financial goals are going to be somewhat more difficult to achieve.
Some of my long-term financial goals will not be achievable.
All my long-term financial goals have been put at risk and will be very difficult to achieve.

12 **To what extent has the 2008/9 stock market decline affected your ability to achieve your medium term financial goals?**
I do not have any medium term financial goals.
My medium term financial goals are not affected.
My medium term financial goals are going to be somewhat more difficult to achieve.
Some of my medium term financial goals will not be achievable.
All my medium term financial goals have been put at risk and will be very difficult to achieve.

13 **To what extent has the 2008/9 stock market decline affected your ability to achieve your short term financial goals?**
I do not have any short term financial goals.
My short term financial goals are not affected.
My short term financial goals are going to be somewhat more difficult to achieve.
Some of my short term financial goals will not be achievable.
All my short term financial goals have been put at risk and will be very difficult to achieve.

14 **How risky do you think the stock market is today compared with two years ago?**
Much riskier than two years ago.
Somewhat riskier than two years ago.
About the same.
Somewhat less risky than two years ago.
Much less risky than two years ago.

15 **How do you expect your stock market investments will perform over the next twelve months?**
I do not have stock market investments.
I expect to make a large loss.
I expect to make a small loss.
I expect to break even.
I expect to make a small profit.
I expect to make a large profit.

16 **How do you expect the stock market to perform over the next twelve months compared to long term averages?**
Much worse than long term averages.
Somewhat worse than long term averages.
About the same as long term averages.
Somewhat better than long term averages.
Much better than long term averages.

17 **How has the value of your equity in your home(s), that is, value(s) minus mortgage(s), changed over the past two years?**
I am not a home-owner.
My equity has been wiped out.
My equity has been substantially reduced.
My equity has been somewhat reduced.
There has been no change.
My equity has been somewhat increased.
My equity has been substantially increased.

18 **Of your net worth, that is, all you own minus all you owe, what percentage does the equity in your home(s) now represent?**
I am not a home-owner.
0%.
10%.
20%.
30%.
40%.
50%.
60%.
70%.
80%.
90%.
100%.

19 **What is your employment status today?**
Retired.
Semi-retired.
Part-time or casually employed.
Full time publicly employed.
Full time privately employed.
Self-employed.
Home duties.
Unemployed.
Other.

20 **What has happened to your standard of living over the past two years?**
Greatly reduced.
Somewhat reduced.
Unchanged.
Somewhat improved.
Greatly improved.

21 **Did you lose your job in the past two years?**
I was not employed.
Yes.
No.

22 **Did your business fail in the past two years?**
I did not have a business.
Yes.
No.

23 **Do you know anyone who lost their job in the past two years?**
Yes.
No.

24 **Do you know anyone whose business failed in the past two years?**
Yes.
No.

25 **Would you be willing to be interviewed by the Nightly Business Report or Kiplinger's Personal Finance?**
Yes.
No.

26 **Would you be willing to be invited to participate in future academic research?**
Yes.
No.

27 **To what extent has the 2008/9 stock market decline affected your ability to achieve your important financial goals?**
I do not have any long term financial goals.
My long-term financial goals are not affected.
My long-term financial goals are going to be somewhat more difficult to achieve.
Some of my long-term financial goals will not be achievable.
All my long-term financial goals have been put at risk and will be very difficult to achieve.

28 **In general, how often do you worry about everyday issues?**
I never worry.
I sometimes worry.
I worry often.
I worry very often.
I worry all the time.

29 **What worried you the most in the past year?**
Employment.
Family matters.
Health-related issues.
Financial issues.
Other.

30 **How often do you experience financial worries?**
Never.
Very rarely.
Rarely.
Sometimes.
Often.
Very often.
All the time.

31 **How often do you "lose sleep" worrying about your personal finances?**
Never.
Sometimes.
Often.
Very often.
All the time.

32 **Do you ever worry about becoming financially impoverished?**
Never.
Sometimes.
Often.
Very often.
All the time.

33 **What type of financial issue worries you the most?**
Buying a house.
Medical costs.

Credit card debt.
Stock market investing.
Retirement planning.
Other.

34 **Most investors hold both stocks and bonds in their investment portfolios. Which do you worry about more, stocks or bonds?**
I do not have both stocks and bonds in my investment portfolio.
Stocks.
Bonds.

35 **In the last year, can you remember associating stock market investment with any of the following emotions? (Check boxes that apply.)**
Stress.
Worry.
Fear.
Depression.
Anxiety.

36 **In the last year, can you remember associating the feeling of "worry" with any of the following types of investment? (Check boxes that apply.)**
Stocks.
Bonds.
Real estate.
Derivatives.
Bank savings account.
Certificates of deposit (CDs).

37 **How frequently do you worry about your investments?**
Never.
Very rarely.
Rarely.
Sometimes.
Frequently.
Very frequently.
All the time.

38 **Who do you believe worries more about their financial well-being?**
Men.
Women.

39 **Suppose that you are the only income earner in the family, and you have a good job guaranteed to give you your current (family) after-tax income every year for life. You are given the opportunity to take a new and equally good job, with a 50–50 chance it will permanently double your (family) after-tax income and a 50–50 chance that it will permanently cut your (family) after tax income BY 20%. Would you take the new job?**
Yes. (Go to Q43)
No. (Go to Q40)

40 **Suppose the chances were that there was a 50–50 chance it will permanently double your (family) after tax income and a 50–50 chance that it will permanently cut your after tax income BY 10%. Would you then take the new job?**
Yes. (Go to Q45)
No. (Go to Q41)

41 **Suppose the chances were that there was a 50–50 chance it will permanently double your (family) after tax income and a 50–50 chance that it will permanently cut your after tax income BY 8%. Would you then take the new job?**
Yes. (Go to Q45)
No. (Go to Q42)

42 Suppose the chances were that there was a 50–50 chance it will permanently double your (family) after tax income and a 50–50 chance that it will permanently cut your after tax income BY 5%. Would you then take the new job?
Yes. (Go to Q45)
No. (Go to Q45)

43 Suppose the chances were that there was a 50–50 chance it will permanently double your (family) after tax income and a 50–50 chance that it will permanently cut your after tax income BY A THIRD. Would you still take the new job?
Yes. (Go to Q44)
No. (Go to Q45)

44 Suppose the chances were that there was a 50–50 chance it will permanently double your (family) after tax income and a 50–50 chance that it will permanently cut your after tax income IN HALF. Would you still take the new job?
Yes.
No.

45 Suppose that you are retired and have an option to choose a new investment strategy with a 50–50 chance it will permanently double your retirement income and a 50–50 chance that it will permanently cut your retirement income BY 20%. Would you adopt the new strategy?
Yes. (Go to Q49)
No. (Go to Q46)

46 Suppose the chances were that there was a 50–50 chance it will permanently double your retirement income and a 50–50 chance that it will permanently cut your retirement income BY 10%. Would you adopt the new strategy?
Yes. (Go to Q51)
No. (Go to Q47)

47 Suppose the chances were that there was a 50–50 chance it will permanently double your retirement income and a 50–50 chance that it will permanently cut your retirement income BY 8%. Would you adopt the new strategy?
Yes. (Go to Q51)
No. (Go to Q48)

48 Suppose the chances were that there was a 50–50 chance it will permanently double your retirement income and a 50–50 chance that it will permanently cut your retirement income BY 5%. Would you adopt the new strategy?
Yes. (Go to Q51)
No. (Go to Q51)

49 Suppose the chances were that there was a 50–50 chance it will permanently double your retirement income and a 50–50 chance that it will permanently cut your retirement income BY A THIRD. Would you adopt the new strategy?
Yes. (Go to Q50)
No. (Go to Q51)

50 Suppose the chances were that there was a 50–50 chance it will permanently double your retirement income and a 50–50 chance that it will permanently cut your retirement income IN HALF. Would you adopt the new strategy?
Yes.
No.

*Note that Q51 and Q52 are open-ended questions.

53 If you have a university degree, what level did you obtain?
Associates' Degree.
Bachelors' Degree.
Masters' Degree.
Terminal Degree (PhD, EdD, JD, and so forth)

*Note that Q54 to Q59 are open-ended questions.

60 Which of the following best describes your current relationship status?
Never married or in a de facto relationship.
Married or in a de facto relationship with first partner.
Remarried or in a de facto relationship with subsequent partner.
Separated from spouse or de facto partner.
Divorced from spouse or de facto partner.
Widowed after the death of a spouse or a de facto partner.

*Note that Q61 and Q62 are open-ended questions.

63 During the most recent market downturn (October 2007 to March 2009)
I sold all of my stocks/stock funds.
I sold more stocks/stock funds than I bought, but I did not sell all.
I held my stocks/stock funds, but did not make any new purchases.
I bought more stocks/stock funds than I sold.

64 Which investment would you prefer, given an expected annual return of 8%?
Investment A, with an expected annual appreciation of 4% and an expected annual dividend yield of 4%.
Investment B, with an expected annual appreciation of 5% and an expected annual dividend yield of 3%.
Investment C, with an expected annual appreciation of 6% and an expected annual dividend yield of 2%.
Investment D, with an expected annual appreciation of 8% and an expected annual dividend yield of 0%.

65 Suppose you have owned a stock for several years that had a long-term expected return of 8%, and all return was in the form of appreciation—it paid you no dividend check. If the market, and your stock, was down 40% this year, how likely would you be to sell it?
I would definitely sell the stock.
I would probably sell the stock.
I probably would NOT sell the stock.
I definitely would NOT sell the stock.

66 Now, suppose you have owned a stock for several years that had a long-term expected return of 8%, but 4% was from appreciation, and you had received a check every quarter that made up the other 4%. If the market, and your stock, was down 40% this year but the quarterly dividend checks were continuing as before, how likely would you be to sell it?
I would definitely sell the stock.
I would probably sell the stock.
I probably would NOT sell the stock.
I definitely would NOT sell the stock.

References

Bernasek, A., & Shwiff, S. (2001). Gender, risk and retirement. *Journal of Economic Issues*, *35*, 345–356.

Chang, C., DeVaney, S. A., & Chiremba, S. T. (2004). Determinants of subjective and objective risk tolerance. *Journal of Personal Finance*, *3*, 53–67.

Chaulk, B., Johnson, P. J., & Bulcroft, R. (2003). Effects of marriage and children on financial risk tolerance: A synthesis of family development and prospect theory. *Journal of Family and Economic Issues*, *24*, 257–279.

Davey, G. (2004). *Assessing Risk Tolerance: A Micro-Behavioral Case Study. The Investment Think Tank: Theory, Strategy and Practice for Advisers.* Princeton, NJ: Bloomberg Press.

Faff, R., Hallahan, T., & McKenzie, M. (2009). Nonlinear linkages between financial risk tolerance and demographic characteristics. *Applied Economics Letters*, *16*, 1329–1332.

Fan, J. X., & Xiao, J. J. (2006) Cross-cultural differences in risk tolerance: A comparison between Chinese and Americans. *Journal of Personal Finance*, *5*, 54–75.

Gilliam, J., Chatterjee, S., & Zhu, D. (2010). Determinants of risk tolerance in the baby boomer cohort. *Journal of Business & Economics Research*, *8*, 79–87.

Grable, J. E. (2000). Financial risk tolerance and additional factors that affect risk taking in everyday money matters. *Journal of Business and Psychology*, *14*, 625–630.

Grable, J. E., & Joo, S. (1999). Factors related to risk tolerance: A further examination. *Consumer Interests Annual*, *45*, 53–58.

Grable, J. E., & Joo, S. (2000). A cross-disciplinary examination of financial risk tolerance. *Consumer Interests Annual*, *46*, 151–157.

Grable, J. E., & Joo, S. (2004). Environmental and biopsychosocial factors associated with risk tolerance. *Financial Counselling and Planning*, *15*, 73–82.

Grable, J. E., Lytton, R. H., & O'Neill, B. (2004). Projection bias and financial risk tolerance. *The Journal of Behavioral Finance*, *5*, 142–147.

Grable, J. E., Lytton, R. H., O'Neill, B., Joo, S., & Klock, D. (2006). Risk tolerance, projection bias, vividness, and equity prices, *Journal of Investing*, *15*, 68–74.

Hallahan, T. A., Faff, R. W., & McKenzie, M. D. (2004). An empirical investigation of personal financial risk tolerance. *Financial Services Review*, *13*, 57–78.

Hung, A. A., & Yoong, J. K. (2009). *Asking for Help: Survey and Experimental Evidence on Financial Advice and Behavior Change.* RAND Labor and Population Working Paper, WR714-1, RAND Corporation, Santa Monica, CA.

Jianakoplos, N. A., & Bernasek, A. (1998). Are women more risk averse? *Economic Inquiry*, *36*, 620–630.

Van de Venter, G., & Michayluk, D. (2007). *Risk Tolerance: Additional Insights From Unexplored Factors.* Working Paper, University of Technology Sydney, Sydney, NSW, Australia.

Xiao, J. J., Alhabeeb, M. J., Hong, G., & and Haynes, G. W. (2000). Risk tolerance of family business owners. *Consumer Interest Annual*, *46*, 140–146.

Yao, R., Hanna, S. D., & Lindamood, S. (2004). Changes in financial risk tolerance, 1983–2001. *Financial Services Review*, *13*, 249–266.

Yook, K. C., & Everett, R. (2003). Assessing risk tolerance: Questioning the questionnaire method. *Journal of Financial Planning*, *16*, 48–55.

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