An Empirical Analysis Linking a Person's Financial Risk Tolerance and Financial Literacy to Financial Behaviors

Jamie Wagner
Ph.D. Student
University of Nebraska Lincoln

Abstract

Financial risk aversion can affect how one behaves financially. Are people who take more financial risks more likely to have an emergency fund, own a home, be a saver, and have good credit card behavior? This paper uses the 2009 FINRA data set to examine how risk, financial literacy, and demographic characteristics affect the likelihood that a respondent has an emergency fund, owns a home, is a saver, and has good credit card behaviors. Results from the paper show that a person's self-reported financial risk score has a positive effect only on whether or not the individual has an emergency fund but not the other three dependent variables. Financial literacy positively affects owning a home and having good credit card behaviors. Financial risk tolerance depends on the person's willingness and ability to take on the risk. That ability to take on the risk is thought of as the person's wealth and financial knowledge. Implications of this paper suggest that financial behaviors may be driven more by a person's ability to take on financial risks rather than their willingness to take on the financial risk.

Introduction

Risk tolerance is a topic that has been heavily studied yet there is so much to still understand. Studies on risk tolerance extend into many sectors of research including finance, economics, business, investing, and psychology. An economist studies how people behave and make choices, it is assumed that people all act in a rational manner. A person's risk tolerance can affect the choices that they make and a person's financial risk tolerance can affect their financial behaviors. Risk tolerance is a topic that many feel it is necessary to continue studying in order to understand how people behave and respond in different situations. Financial literacy can also affect a person's financial behaviors. It is assumed that the more financially literate one is, the better financial behaviors that they will engage in.

This study will add to the literature by looking at how one's self-reported financial risk tolerance, financial literacy, and demographic characteristics affect four specific financial behaviors—having an emergency fund, owning a home, being a saver, and having good credit card behavior. The FINRA survey asks a series of five financial literacy questions that gives researchers the ability to include a measure of the individual's financial literacy. Previous studies have included financial literacy to see how that can affect risk tolerance. Interactions between education, financial knowledge, income, and

occupation have helped explain the variation of risk tolerance among respondents (Grable, 2000). We expect that financial risk tolerance and financial literacy to each have a positive relationship with the four financial behaviors. Being willing to take on more financial risks is generally associated with higher wealth accumulation allowing the individual to engage in the financial behavior. Those who are more financially literate should be able to make better financial decisions.

Results from the probit models show that a person's financial risk tolerance only affects whether or not someone has an emergency fund. As expected there is a positive relationship—as the self-reported measure of risk aversion increases by one, people are about 1.4 percent more likely to have an emergency fund. Financial literacy affects whether or not an individual owns a home and if they have good credit card behaviors. Also as expected the signs on these coefficients are positive. Answering one more financial literacy question correctly is associated with a 3.6 and 2.95 percent increase in the likelihood that one owns a home or has good credit card behavior respectively. The lack of significance for the other two behaviors is likely due to the type of question asked in the FINRA data set—the questions asked are financial calculations that those who own a home or have a credit card are more likely to have done.

The paper is structured as follows: The next section goes over the methodology, including a description of the data, the independent variables, and the dependent variables. Following the methodology section are the results, including both the descriptive statistics and regression results. Finally the paper ends with a discussion of the findings and a conclusion.

Literature Review and Theoretical Background

Recent studies have focused on both the definition and determinants of risk tolerance. Grable (2008) defines risk tolerance as the "willingness of an individual to engage in a behavior where there is a desirable goal but attainment of the goal is uncertain and accompanied by the possibility of loss" (Grable, 2008). One sector of risk tolerance specifically looks at how financially risk tolerant one is. It is important to understand how one's financial risk tolerance (FRT) can affect many people's lifestyles and affect their financial behaviors. For example, understanding how a person feels about financial risk

could help financial advisors serve their clients by being able to put together better financial portfolios based upon their level of FRT (Roszkowski, Davey, and Grable, 2005). Those who are more financially risk tolerant are more financially satisfied (Joo and Grable, 2004). A household's finances can cause a lot of frustration and stress and being able to be satisfied with your finances can help reduce those feelings. It is important to keep expanding upon this concept of risk and continuing to understand how risk can affect all of the aspects of one's life.

Financial risk tolerance combines both one's attitude and their capacity to take on the risk—it is a measure of a person's willingness and ability to take on financial risks (Roszkowski and Grable, 2005). In order to accurately measure FRT, questions need to look at an individual's attitude about risk, which is more psychological, and their capacity to take on the risk, which is more about their finances and financial knowledge. This study attempts to control for both the willingness to take on risk by using a person's self-reported measure of financial risk tolerance and their ability by controlling for wealth and financial literacy. Risk aversion is a more general measure of one's overall risk tolerance. One study finds that there is a negative and significant relationship between financial risk tolerance and risk aversion which is expected, suggesting that those who are generally risk averse are going to be less likely to tolerate financial risk (Faff, Mulino, and Chai, 2008).

Studies have attempted to explain FRT by individual characteristics. Studies have used gender, age, occupation, income, education, financial knowledge, and economics expectations to explain FRT and are significant indicators of the degree of FRT experienced by individuals (Grable, 2000). Grable also outlines in a chapter from the Handbook of Consumer Finance Research (2008) various factors associated with FRT that have been given significant attention and support in the research. Those factors include personal demographics, net worth, financial satisfaction, financial knowledge, income source, income variability, household size, homeownership, religiosity, self-esteem, personality, sensation seeking, and mood. Another study finds that gender, age, the number of dependents, marital

status education, income, and wealth are all related to financial risk tolerance (Hallahan, Faff, and McKenzie, 2004).

Research done by Grable (2000 and 2008) show that men, those with higher income, those with a professional job, and those with more educational attainment are more financially risk tolerant. Palsson (1996) also finds in her paper that men are more financially risk seeking. Another study which focusses specifically on gender, attempts to understand whether or not women are more risk averse. The results of the study depended upon whether the gamble was abstract or concrete and that in hypothetical situations there was no evidence of a difference between men and women's attitudes about financial risk (Schubert, et. al., 1999). Age has also been studied to see how FRT changes as one get older. Those who are older are more risk tolerant (Grable (2000) and Palsson, 1996). Another study includes an age-squared variable to look at the linearity of age and risk; findings from this article show that there is a negative linear term and a positive quadratic term—that is those who are young and old are more risk tolerant than those who are middle aged (Faff, Mulino, and Chai, 2008).

Both risk tolerance and FRT are complex subjects. In order to get accurate information about an individual's FRT a good measure of tolerance must first be implemented. Significant research has been done looking specifically at how to test both risk aversion and financial risk aversion. In order for one to get an accurate measure of risk tolerance, good questions must be asked; that is they must be valid and reliable. "Good" questions are those that solely assess the financial risk tolerance of the individual (Roszkowski, Davey, and Grable, 2005). The authors have uploaded examples of both "good" and "bad" questions to their website[1]. The 2009 Financial Industry Regulatory Agency (FINRA) national survey poses a question to the respondents to rate their level of risk aversion on a 1-10 scale. This is one example of a good FRT question because it specifically asks about financial risk.

Risk assessment is complex, studies have shown that assessments needs to be done carefully and with many questions in order to get the individual's true feelings about risk (Roszkowski, Davey, and

[1] The Fina-Metrica website is www.Risk-profiling.com

Grable, 2005). The FINRA survey only asks one question which is a self-reported measure of their financial risk tolerance. While only asking one question is a limitation of the FINRA dataset, research has been done showing that a self-assessment of FRT is a more accurate estimate of their true financial risk aversion compared to the assessment done by an advisor (Roszkowski and Grable, 2005).

Much of the literature focusses on what determines whether someone is more or less financially risk tolerant. More attention and focus needs to be about what behaviors a financially risk averse or financially risk seeking person engages in. This study adds to the literature by using the 2009 FINRA's National Survey of Financial Capability in the United States. This is a survey dedicated to measure households' financial capabilities in order to better understand how people manage their finances.

This study also attempts to predict behavior of people based upon their level of financial risk tolerance. Other studies have attempted to look at how financial risk aversion can affect behaviors; one study finds that those who have low risk tolerance are less likely save (Fisher and Montalto, 2011). Another study shows that those who have higher risk tolerance have higher net wealth (Finke and Huston, 2003 and Hallahan, Faff, and McKenzie, 2004). The behaviors looked at in this study are whether or not the individual has an emergency fund set up, how the households behave with credit cards, whether the household owns a home, and if the household is considered a saver. Understanding how FRT affects financial decisions and behaviors can help policy makers and financial advisors improve upon their services to their clients.

One behavior, having adequate emergency funds, has been given a lot attention in the literature. It is important to have an emergency fund in order for families to protect themselves against unforeseen events that could put them under financial stress. The family must also put away enough money in the emergency fund to protect them. The exact amount in an emergency fund is still up for debate, many financial advisors suggest that there should be adequate money to support the household for three months (Bhargava and Lown, 2006). Bhargava and Lown (2006) cite from previous research that from 1977-1989, about a third of U.S. households meet the three month criterion and about one

fifth of households have about six months of emergency funds. Using the 1998 and 2001 Survey of Consumer Finances research finds that less than half of the household surveyed had even two months of emergency funds (Bhargava and Lown, 2006). These results show that households are unprepared to handle negative financial events. Households do not have enough money to buffer themselves if a family member loses a job, if there is a recession, or other financial events that could affect their finances.

Using the 1998 and 2001 SCF to look at the characteristics of those who have emergency funds. Characteristics noted to affect whether or not a household has enough emergency funds available include age, education, employment, occupation, marital status, race, and income. The authors found a positive and significant relationship between a household's willingness to take risks and having adequate emergency funds (Bhargava and Lown, 2006). Another study using the 1992 SCF finds a positive relationship between households who are willing to take on risk and having adequate emergency funds. The authors find that compared to those who are more risk averse, those who are willing to take on some risk are 1 to 1.5 times more likely to have enough in their emergency funds. Reasoning behind this finding is that those who are willing to take risks are also likely to have more assets in liquid form (Huston and Chang, 1997). These results tie into what was previously said about financial risk taking. Not only does the individual have to be willing to take the risk, they also have to have enough assets to be able to take on the risks.

Methodology

Data

This paper uses a cross-section data set, the Financial Capability in the United States—2009 National Survey produced by the Financial Industry Regulatory Agency (FINRA). The survey measures the financial capabilities of households in the U.S. to find out about their banking habits, their asset ownership, their participation in pensions and retirement plans, and collects information about their debt, including credit cards. The survey also asks five questions in order to better understand people's financial knowledge. This survey is an attempt to

understand how people in the U.S. manage they finances. It also includes individual demographic characteristics and some questions that attempt to understand how people perceive their knowledge, or attitudes towards their financial situation.

In order for this survey to be nationally representative it is weighted in order to reflect the census distributions. Therefore, the survey oversamples based on education and ethnicity. In order to have at least 150 observations in each category, oversampling is obtained for African-American, Asian, and Hispanic group. Also, those who have less than a high school education are also oversampled. To take this oversampling into account for the descriptive statistics and regressions, the sample was weighted by ethnicity and education. The full national survey has a total of 1488 observations. Observations were eliminated if the household did not answer all of the questions which leaves about 1466-1471 observations for each probit regression.

Dependent Variables

The dependent variables used in the model are certain financial behaviors that might be affected by a household's willingness to take on financial risks or their financial knowledge. Those behaviors include whether or not the household has an emergency fund, if the household owns a home, if they are a saver, and the individual's credit cards behavior. These are a few financial areas that a person's willingness to take on risk could affect these behaviors. See Table 1 for a list of the specific question for each dependent variable.

The FINRA data set asks households if they have ever set aside emergency funds that would cover 3 months of expenses. The variable is coded as a dummy variable equal to one if the household responded that they do have an emergency fund. Another behavior, whether or not the household is considered a saver, is a dummy variable equal to one if the respondent said that within the past year the household's spending was less than income or if the household's spending was equal to their income.

Risk may also affect whether or not the respondent owns a home. Another dependent variable is a dummy variable equal to one if the respondent or household owns their home.

The last dependent variable used in this paper is a credit card behavior score. The credit card behavior score is a summation of various credit card behaviors. Those who have a higher credit card behavior score engage in more negative credit card behaviors. There are six credit card behavior questions that go into this credit card behavior score. Each question is coded as a dummy variable equal to one if the respondent reported that they engage in the behavior and then summed together to create their credit card behavior score. Specific wording of each credit card behavior question is in Table 1. For this paper, the credit card behavior score was coded as a 1 for having good credit card behaviors if the respondent reported that they do two or less (the mean score was two) of the bad credit card behaviors.

Table 1: Description of the Dependent Variables

Variable	FINRA Question
Emergency funds	Have you set aside emergency or rainy day funds that would cover you expenses for 3 months, in case or sickness, job loss, economic downturn or other emergencies?
Saver	Over the past year, would you say that your (household's) spending was less than, more than, or equal to your (household's) income?
Homeowner	Do you (or your spouse/partner) currently own your home?
Credit Card Behavior Score	In the past 12 months, which of the following describes your experience with credit cards • I always paid my credit cards in full (coded as a 1 if they responded no). • In some months, I carried over a balance and was charged interest. • In some months, I paid the minimum payment only. • In some months, I was charged a late fee for late payment. • In some months, I was charged an over the limit fee for exceeding my credit line. • In some months, I used the cards for a cash advance.

Independent Variables

Independent variables in this study include respondents' demographic characteristics, financial literacy score, and a self-reported measure of the respondents' willingness to take risks. Demographic characteristics include gender, marital status, employment status, whether or not the respondent has children, education level, race, income, and age.

A respondent's willingness to take financial risks is a self-reported 1-10 scale with 1 being that the respondent is unwilling to take financial risks and 10 being that the respondent is very willing to take financial risks. We would expect there to be a positive relationship between financial riskiness and emergency funds. Those who are more willing to take on financial risks are more likely to have an emergency fund (Bhargava and Lown, 2006 and Huston and Chang, 1997).

Being willing to take on more risks is rewarded with greater returns. One study that uses the 1998 SCF finds that those who are willing to take on more risks have higher net worth and financial assets (Finke and Huston, 2003). We would expect that risk would have similar effect on being considered a saver. An emergency fund is just a more specific form of saving—saving for a rainy day. Also, because of the positive relationship between risk and accumulating financial assets one would expect there to be a positive relationship between risk and owning a home. A house is an important and large purchase that requires a certain amount of asset accumulation in order to get a mortgage and own a home.

Previous research finds that there is a positive relationship between emergency funds and having a credit card. Their reasoning is that in order to have a credit card, one must have some sort of credit backed by assets that they hold (Bi and Montalto, 2004). There is a complimentary relationship between credit cards and emergency funds which implies that we would expect there to be a positive relationship between risk aversion and having good credit card behaviors. Those who are willing to take on more risks and acquire more assets and wealth would be able to obtain credit cards easily. Also, the questions that go into the credit card behavior score ask about the respondents paying fees or paying off a minimum balance. Those who are wealthier will have less troubles paying on time and paying off

their balance each month which makes the respondents have a lower credit card behavior score. Also, research using the SCF find that credit card holders tend to have characteristics that would lead the authors to think that they were riskier. Credit card holders are more likely to not be married, not stay with a job as long, and have weaker income and balance sheets (Black and Morgan, 1998). The null hypotheses for this paper are that financial risk tolerance and financial literacy have positive relationships with having an emergency fund, owning a home, being a saver, and having a good credit card behavior score.

There should be a positive relationship between the respondent's financial literacy score and each of the dependent variables. The five questions look at the respondent's basic financial ability. It is expected that people will have better financial behaviors the more financially literate they are.

The demographic characteristics are expected to have a similar effect on each of the dependent variables. It is expected that men are more likely than women to have emergency funds, own a home, be a saver, and have better credit card behaviors. This effect is likely due to the nature that men are more risk seeking than women and will then accumulate more wealth. Those who are married are also more likely to have emergency funds, own a home, be a saver, and have better credit card behaviors. Once again this is likely tied to them having more money between the two individuals. Also, those who are married likely have a family, so they are more likely to save for their kids and engage in the four financial behaviors looked at in this paper.

Employed respondents, full-time, part-time, or self-employed, are more likely to engage in the financial behaviors as well. Because the financial behaviors require a certain amount of financial stability those who are employed are more likely to be able to have an emergency fund, own a home, be a saver, and have good credit card behaviors. Similarly, those who have higher incomes are able to participate in the financial behaviors. In order to save money or have an emergency fund, you must have money to do so. Also one must have some sort of wealth accumulation to be able to have a credit card or to take out a loan to purchase a home.

Age and education are also like to have similar positive effects. Those who are older are likely to have accumulated more wealth and therefore engage in the financial behaviors. Those who are older are almost more financially experienced which can encourage good financial behaviors. For example, those who are older and who have experience with credit cards may have learned through experience to pay off the balance in full to avoid high interest rates. Similarly, those who have higher education are also more likely to engage in the positive financial behaviors. Those who have higher education are more likely to have higher incomes which can positively affect whether they engage in the financial behavior. Also, those who have gone to college may have taken a finance class which would increase their likelihood of having an emergency fund, owning a home, being a saver, and having good credit card behaviors. The following section has the descriptive statistics, the model, and the four probit models used in the paper.

Results

Descriptive Statistics

Descriptive statistics are found in Table 2. The sample shows that almost half, 49 percent, of those surveyed responded that they have an emergency fund which follows previous research by Bhargava and Lown (2006) who find that just under a half of respondents had at least three months of emergency funds. Just over 60 percent of the respondents own their home. A majority of the respondents are considered savers, just over 88 percent reported that they spend less than or equal to their income. The average credit behavior score was 1.6, therefore people engage in less than two of the credit card behaviors described in Table 1. For the probit regression the credit card behavior was split at 2. Therefore those who engage in less than or equal to two bad credit card behaviors they are considered to have good credit behavior and those who engage in more than 2 credit card behaviors are considered to have bad credit card behaviors.

The average risk aversion score is 4.11. The variable is a 1-10 self-reported measure of financial risk aversion. This average suggests that those who were surveyed leaned toward not being willing to take on financial risks. The average financial literacy score for the sample was 2.46. On average, people

can only answer about half of the financial literacy questions correctly. About half of the respondents are male. The majority of those surveyed, about 69 percent, are white. Almost half of the respondents reported that they have at least one child. Over half of those surveyed are employed full-time, part-time, or self-employed.

The survey shows that about 30 percent of the respondents have graduated high school, and less than 30 percent of the respondents, 28 and 27 percent, have some college and have graduated college respectively. About 32 percent of those surveyed reported an income between $35,000-75,000, 33 percent reported an income less than $25,000, and almost 6 percent reported income greater than $150,000. Finally, about 14 percent of the survey respondents reported that they were between 18-24, about 17 percent reported that they are 25-34 years old, 18 percent are 35-44, 19 percent are 45-54, 14 percent are 55-64, and about 18 percent of the respondents are older than 65. A description of the data analysis follows in the next section.

Table 2: Descriptive Statistics

	mean	sd
Emergency Fund	0.4933	0.5001
Willingness to take risk	4.1111	2.6551
Male	0.4864	0.5000
Married	0.5487	0.4978
Single	0.2565	0.4369
Divorced	0.1159	0.3203
Widowed	0.0788	0.2695
Full-time	0.3959	0.4892
Part-time	0.0956	0.2942
Self-employed	0.0830	0.2760
Unemployed	0.0804	0.2720
Retired	0.1816	0.3856
Not in the labor force	0.1635	0.3700
Has at least 1 child	0.4826	0.4999
Less than high school	0.1422	0.3494
Graduated high school	0.3091	0.4623
Has some college	0.2798	0.4491
Graduated college or postgrad	0.2689	0.4435
White	0.6855	0.4645
Black	0.1149	0.3190
Hispanic	0.1337	0.3405
Asian	0.0457	0.2089
Other or 2+	0.0202	0.1406
Less than $15,000-25,000	0.3342	0.4719
$25,000-35,000	0.1028	0.3037
$35,000-75,000	0.3210	0.4670
$75,000-150,000	0.1833	0.3870
$150,000 or more	0.0588	0.2354
18-24	0.1396	0.3467
25-34	0.1728	0.3782
35-44	0.1798	0.3841
45-54	0.1868	0.3899
55-64	0.1430	0.3502
56+	0.1780	0.3826
Owns home	0.6121	0.4874
Spends > income	0.1161	0.3205
Spends ≤ income	0.8839	0.3205
Financial knowledge score	2.4628	1.4844
Credit behavior score	1.6469	1.6324
Observations	1488	

Probit Regression Results

Several probit models were run in order to test how a person's willingness to take financial risks and their financial literacy affects various financial behaviors. Those behaviors, described above are, whether or not a person has an emergency fund, if they own a home, whether or not the person reported that they are a saver, and whether or not the respondent has good credit card behaviors. The following model is used to look at how a person's willingness to take risks, their financial literacy, and other demographic characteristics affect the financial behaviors listed.

$$y = \beta_1 + \beta_2 risk + \beta_3 X + \beta_4 financial\ literacy$$

Y is the financial behaviors looked at: having an emergency fund, owning a home, being a saver, and having good credit card behaviors. Risk is the self-reported 1-10 scale of a person's willingness to take on financial risks. The vector X is a set of personal demographic characteristics. The variable, financial literacy is the respondent's score based on correct answers to five financial literacy questions asked in the survey. Results from the four probit models are found in Table 3. Marginal effects are reported in the table.

Table 3: Probit Model Regression Results (Emergency fund, owns a home, saver, good credit card behavior)

	(1)	(2)	(3)	(4)
Willingness to take risk	0.0136**	0.0062	-0.0015	0.0088
	(0.006)	(0.006)	(0.003)	(0.006)
Male	0.0386	-0.0993***	-0.0118	0.0079
	(0.032)	(0.035)	(0.018)	(0.033)
Married	0.0383	0.1528***	0.0118	0.0957**
	(0.051)	(0.050)	(0.029)	(0.049)
Single	0.0761	-0.1107*	0.0270	0.0958*
	(0.058)	(0.058)	(0.029)	(0.057)
Widowed	0.0234	0.0589	-0.0294	0.2058***
	(0.074)	(0.068)	(0.049)	(0.070)
Employed	0.0154	-0.0081	0.0035	0.1105**
	(0.049)	(0.051)	(0.026)	(0.049)
Part-time	0.0251	0.0430	-0.0723*	0.0022
	(0.065)	(0.065)	(0.044)	(0.066)
Self-employed	0.0149	0.0660	-0.0013	0.1827***
	(0.064)	(0.061)	(0.034)	(0.061)
Unemployed	0.0116	0.0375	0.0081	0.1047
	(0.063)	(0.063)	(0.030)	(0.065)
Retired	0.1524**	0.1495**	0.0649**	0.2212***
	(0.066)	(0.064)	(0.027)	(0.066)
Has at least 1 child	-0.0413	0.0588	-0.0285	-0.0404
	(0.037)	(0.040)	(0.021)	(0.038)
Less than high school	-0.2001***	0.0063	-0.0483	-0.0683
	(0.053)	(0.055)	(0.034)	(0.058)
Has some college	-0.0280	-0.0065	-0.0076	0.0953**
	(0.039)	(0.040)	(0.021)	(0.039)
Graduated college/ postgrad	0.0844**	0.0473	0.0198	0.1041**
	(0.043)	(0.043)	(0.023)	(0.043)
White	-0.0289	0.1226*	0.0290	-0.1917***
	(0.056)	(0.066)	(0.033)	(0.056)
Black	-0.1789***	-0.0381	-0.0083	-0.3269***
	(0.063)	(0.075)	(0.037)	(0.048)
Hispanic	-0.0927	0.0632	0.0666***	-0.1961***
	(0.071)	(0.077)	(0.024)	(0.064)
Other or 2+	-0.0773	-0.0856	0.0224	-0.2155***
	(0.094)	(0.108)	(0.041)	(0.076)
$25,000-35,000	0.1386***	0.0891*	-0.0049	0.1718***
	(0.052)	(0.050)	(0.029)	(0.053)
$35,000-75,000	0.2933***	0.2816***	0.0513**	0.2930***
	(0.043)	(0.040)	(0.022)	(0.045)
$75,000-150,000	0.4158***	0.3040***	0.0898***	0.3739***
	(0.042)	(0.038)	(0.020)	(0.048)
$150,000 or more	0.4733***	0.3091***	0.0814***	0.3827***
	(0.033)	(0.037)	(0.018)	(0.056)
18-24	-0.2194***	-0.4571***	-0.0495	-0.1688**
	(0.074)	(0.074)	(0.060)	(0.074)
25-34	-0.2989***	-0.3391***	-0.0160	-0.2238***
	(0.065)	(0.081)	(0.050)	(0.067)
35-44	-0.2146***	-0.2490***	-0.0077	-0.2063***
	(0.072)	(0.084)	(0.047)	(0.069)
45-54	-0.2257***	-0.0600	-0.0133	-0.1374**
	(0.068)	(0.080)	(0.046)	(0.070)
55-64	-0.1536**	-0.0878	0.0164	-0.0555
	(0.063)	(0.073)	(0.039)	(0.065)
Financial knowledge score	0.0027	0.0360***	-0.0013	0.0295**
	(0.012)	(0.012)	(0.007)	(0.012)
Pseudo R^2	.1922	.3166	.0777	.1830
Observations	1468	1466	1466	1471

The results show that one's willingness to take risks has a positive and significant relationship with whether or not the individual has an emergency fund but not with the other dependent variables. Those who increase their willingness to take on financial risks by one point are about 1.4 percent more likely to have an emergency fund. This result follows previous research suggesting that there should be a positive relationship between taking financial risks and having an emergency fund. Owning a home may not be as related to risk because it is seen as a safe and a long term investment. Similarly saving may not be related to risk because regardless of how one feels about risk, saving is generally considered a good idea. Also, in the sample, 88 percent were considered savers, which is likely why there is no significant effect between risk and saving. Having good credit card behaviors may also not be affected by risk because credit cards are commonly used and not seen as a risky behavior by many. Also, the average credit card behavior was about 1.6, which suggests that people have fairly good credit card behaviors.

A person's financial literacy score has a positive and significant relationship with owning a home and having good credit card behavior. An increase of a person's score by one question increases the likelihood that the respondent owns a home by about 36 percent and increases the likelihood that a person has good credit card behavior by about 30 percent. Financial literacy score does not affect if a person has an emergency fund or if they are considered a saver. The questions asked in the FINRA survey cover interest rates, inflation, bonds, mortgages, and stocks. Thus knowing these questions might be more beneficial for homeowners because they are likely to have already had to figure out some of the calculations during the home buying process. Also, those who have credit cards are likely to have a better understanding of interest rates. Therefore the questions asked in the FINRA survey may ask financial questions that relate more to owning a home and credit cards than spending less than or equal to their income and having an emergency fund.

Those who are retired are about 15 percent more likely than those who are not in the labor force to have an emergency fund. Those who are retired also might need to have an emergency fund because they are not working and have a limited income. Respondents who have less than a high school diploma are 20 percent less likely than those who have a high school diploma to have an emergency fund while those who have graduated college or have some post graduate schooling are about 8.4 percent more likely than those with a high school diploma to have an emergency fund. Black respondents are almost 18 percent less likely than Asian respondents to have an emergency fund.

In previous literature, income has been a factor that has affected whether or not an individual has an emergency fund. Those who are better able to set up an emergency fund, those with more money, are also more likely to have one. Results from the first column suggest that compared to those with income less than $25,000 respondents are between 14 and 47 percent more likely to have an emergency fund. As income increases so does the likelihood have having an emergency fund which strongly suggests that in order have an emergency fund you must have enough money to put some aside. Age also follows the expected trend that compared to those who are over 65, all other respondents are between 15 and 30 percent less likely to have an emergency fund. This age result follows the employment result from earlier that those who are retired are more likely to have an emergency fund. Those who are over 65 are also likely to be the individuals that are retired.

In the second column, males are almost 10 percent less likely than female respondents to own their own home. This result may not follow intuition due to the risk seeking nature or men. Married respondents are 15 percent more likely than divorced respondents to own their home. Also, single respondents are 11 percent less likely than divorced respondents to own their home. This may be attributed to an income effect that those who are married may have more money to buy a home while those who are single do not have the additional income to help pay for their mortgage. Retired individuals are 14 percent more likely than those who are not in the labor force to own a home. Those who are retired probably bought their house a while back when they were working and have through

the years acquired enough assets and money to own their home. White households are 12 percent more likely to own their home.

Education does not have any direct effects on whether or not the respondent owns their own home. However age and income does effect whether or not one owns their home. Compared to those who have incomes less than $25,000, those with more money are between 8 and 31 percent more likely to own their home. This result follows what we would expect. In order to get a loan and to keep a house, you must have adequate money, those who make less than $25,000 a year are likely unable to afford a home. This income effect also increases in magnitude as income increases suggesting that those who are wealthier are increasingly more likely to own their own home. There are similar results for age, those who are 18-44 are between 24 and 45 percent less likely to own a home compared to those who are 65. The significance goes away for the 34-44 and 45-54 age groups.

Looking at the third column those who work part time are just under 8 percent less likely than those who are not in the labor force to be considered a saver. Also, those who are retired are about 6 percent more likely than those who are not in the labor force to be considered a saver. Respondents who reported that they were Hispanic or Latino are almost 7 percent more likely than Asian households to be considered a saver.

The income results have the expected signs and are similar to the emergency fund results that in order to save or have an emergency fund the household needs to have money to put aside. Therefore, compared to those who make less than $25,000 a year, those who make more than $35,000 are between 5 and 9 percent more likely to be considered a saver—they spend less than or equal to the income. There is no age effect, which is likely to be because the income variables capture so much of the explanatory power when looking at whether or not someone is a saver. Also, people of all ages should be savers their ability to save may be what stops some people from doing so.

Finally, the fourth column which looks characteristics that determine whether someone is considered to have good credit card behavior. Those who are married are just under 10 percent more

likely than those who reported that they were divorced to have good credit card behavior. Those who responded that they were widowed were about 20 percent more like than those who reported that they were divorced to have good credit behaviors. A divorce is a financially traumatic event; it can have lasting financial repercussions which can affect their credit card behavior.

Compared to those who are not in the labor force, those who are employed, self-employed, and retired are about 8, 15 and 19 percent respectively to have good credit card behaviors. The questions that are used to calculate the credit card behavior score ask about late or limit fees, paying the minimum, and carrying over a balance. Those who have adequate funding are more likely to be able to pay off their cards in full without fees each month. Those who do not have a job are more likely to have a hard time paying off their balance which could lead to a worse credit card behavior score.

Education also affects one's credit card behavior score. As expected those who have more education, some college or their college degree, are 9 and 10 percent respectively more likely to have good credit card behaviors. Those who are in school may have had to deal with taking out loans and looking at another form of debt which would help explain why they have better credit card behaviors. Also, financial literacy has a significant and positive effect for having good credit card behavior. The two together suggest that those who are going to college and are more financially literate have better credit card behaviors. The reasoning behind this could be due to classes taken in college or because they are more likely to have experience with debt.

Compared to respondents who reported that they were Asian, other ethnicity groups are between 19 and 32 percent less likely to have good credit card behaviors. Part of this result could be attributed to an education effect that Asian respondents are also more likely to have higher education. Income follows an expected pattern that those who have more money have better credit card behaviors. Compared to those who make less than $25,000, higher income groups are between 17 and 38 percent more likely to be considered in the good credit card behavior group. This result is expected due to the nature of the questions. As mentioned before, the questions asked mainly look at various

fees and being able to pay off the balance each month. Those who have more money are able to pay off their balance each month or not pay a fee for a late payment; the strength of this effect increases as the income category increases.

Age also follows the expected direction, those who are younger are less likely to have good credit card behaviors compared to those who are older than 65. People less than 55 are between 13 and 22 percent less likely than those who are older than 65 to have good credit card behaviors. This age effect may be due to experience—those who are older have dealt with debt and credit cards before and have learned through experience not to spend more than their limit, or to make sure their balance is paid off each month.

Financial literacy positively affected whether or not the respondent owned a home and their credit card behavior. It is likely that respondents who own a home or who have a credit card have done some of the calculations and understand the concepts that the questions cover in the survey. People with an emergency fund or those who are savers may not have taken the time or have had practice with many of the calculations asked in the FINRA survey. To see if a specific financial literacy question affects one of the dependent variables another regression was run replacing the aggregate financial literacy score with dummy variables for each financial literacy question.

Probit Regression Results with Separated Financial Literacy Questions

Table 4 reports the results for the probit regressions with the financial literacy questions separated to see if any individual question affects whether or not an individual has an emergency fund, owns a home, is a saver, and has good credit card behaviors. Using the aggregate score looks at how the general financial literacy of a respondent affects the various financial behaviors. Using the individual questions makes it easier to see if getting a specific question correct increases their likelihood of engaging in one of the financial behaviors.

Table 4: Probit Model Regression Results with Split Financial Literacy Questions (Emergency fund, owns a home, saver, good credit card behavior)

	(1)	(2)	(3)	(4)
willingness to take risk	0.0134**	0.0065	-0.0017	0.0080
	(0.006)	(0.006)	(0.003)	(0.006)
Male	0.0390	-0.1018***	-0.0119	0.0106
	(0.032)	(0.035)	(0.019)	(0.033)
Married	0.0392	0.1556***	0.0134	0.0927*
	(0.051)	(0.050)	(0.028)	(0.049)
Single	0.0787	-0.1052*	0.0286	0.0969*
	(0.058)	(0.058)	(0.028)	(0.057)
Widowed	0.0230	0.0587	-0.0293	0.2046***
	(0.074)	(0.068)	(0.049)	(0.070)
Employed	0.0169	-0.0123	0.0043	0.1084**
	(0.049)	(0.051)	(0.026)	(0.049)
Part time	0.0250	0.0412	-0.0719*	-0.0052
	(0.065)	(0.065)	(0.044)	(0.065)
Self employed	0.0149	0.0719	0.0010	0.1820***
	(0.064)	(0.060)	(0.033)	(0.061)
Unemployed	0.0137	0.0326	0.0089	0.1039
	(0.063)	(0.063)	(0.030)	(0.064)
Retired	0.1540**	0.1471**	0.0649**	0.2183***
	(0.066)	(0.064)	(0.027)	(0.066)
Has at least 1 child	-0.0422	0.0597	-0.0285	-0.0390
	(0.037)	(0.040)	(0.021)	(0.038)
Less than high school	-0.1984***	0.0083	-0.0472	-0.0710
	(0.053)	(0.055)	(0.034)	(0.058)
Some college	-0.0252	-0.0055	-0.0053	0.0934**
	(0.039)	(0.040)	(0.021)	(0.039)
Graduated college/ some postgrad	0.0905**	0.0552	0.0218	0.1040**
	(0.043)	(0.044)	(0.022)	(0.043)
1.white	-0.0251	0.1272*	0.0314	-0.1876***
	(0.057)	(0.067)	(0.033)	(0.057)
Black	-0.1727***	-0.0346	-0.0045	-0.3191***
	(0.064)	(0.076)	(0.036)	(0.050)
Hispanic	-0.0912	0.0672	0.0680***	-0.1902***
	(0.072)	(0.078)	(0.023)	(0.065)
Other or 2+	-0.0752	-0.0879	0.0245	-0.2122***
	(0.095)	(0.108)	(0.040)	(0.078)
$25,000-35,000	0.1452***	0.0903*	-0.0019	0.1785***
	(0.051)	(0.050)	(0.028)	(0.053)
$35,000-75,000	0.2958***	0.2841***	0.0514**	0.2962***
	(0.043)	(0.039)	(0.022)	(0.045)
$75,000-150,000	0.4196***	0.3090***	0.0899***	0.3782***
	(0.042)	(0.037)	(0.020)	(0.047)
$150,000 or more	0.4729***	0.3110***	0.0804***	0.3798***
	(0.034)	(0.037)	(0.018)	(0.056)
18-24	-0.2187***	-0.4516***	-0.0476	-0.1656**
	(0.075)	(0.075)	(0.059)	(0.075)
25-34	-0.2994***	-0.3374***	-0.0159	-0.2207***
	(0.065)	(0.081)	(0.050)	(0.068)
35-44	-0.2156***	-0.2523***	-0.0063	-0.2104***
	(0.072)	(0.083)	(0.046)	(0.069)
45-54	-0.2246***	-0.0578	-0.0120	-0.1403**
	(0.068)	(0.080)	(0.046)	(0.070)
55-64	-0.1545**	-0.0911	0.0180	-0.0596
	(0.063)	(0.073)	(0.038)	(0.065)

Interest Question	-0.0355	-0.0024	-0.0200	-0.0375
	(0.034)	(0.035)	(0.018)	(0.034)
Inflation Question	-0.0091	0.0815**	-0.0072	0.0345
	(0.035)	(0.037)	(0.019)	(0.035)
Bond Question	0.0447	0.0334	0.0189	0.0799**
	(0.040)	(0.042)	(0.021)	(0.040)
Mortgage Question	0.0261	0.0687**	0.0116	0.0191
	(0.033)	(0.034)	(0.018)	(0.033)
Stock Question	-0.0088	-0.0090	-0.0061	0.0618*
	(0.033)	(0.035)	(0.017)	(0.033)
Pseudo R^2				
Observations	1468	1466	1466	1471

Results in Table 4 look similar to Table 3. Variables that are significant in Table 3 are also significant in the same direction and similar magnitude when each financial literacy question is controlled for. As a respondent's risk tolerance increases by one point a person is about 1.3 percent more likely to have an emergency fund. The self-assessed financial risk tolerance score is not significant in any other regression.

The separated financial literacy questions are only significant in regressions 2 and 4. Regressions 2 and 4 were also the only regressions from the original probit models that the financial literacy score was significant. As expected the inflation question and mortgage question significantly predicted whether or not a respondent owned a home. A respondent who answered the inflation and mortgage question correct were about 8 and 7 percent respectively more likely to own a home. Respondents who own a home are more likely to have done calculations that look at different lengths of mortgages to determine how much they are going to pay in the long run. Also, people who are buying a home need to be concerned with how inflation affects the value of money to make sure that they can afford the house that they purchased.

Respondents who answered the bond and stock question correctly were 8 and 6 percent respectively more likely to have good credit card behaviors. The bond question asks about the inverse relationship between bond prices and interest rates. Similarly, someone who has good

credit card behaviors are also likely to understand rates of return and how interest rates affect the return on stocks and bonds. Someone who knows how interest works when they are paying the interest is also likely to understand interest when they are receiving interest. People who have good credit card behaviors are likely to be more knowledgeable about interest rates in general.

Income also has similar effects as before. Compared to respondents who make less than $25,000 a year, higher incomes increase the likelihood that a individual has an emergency fund, owns a home, is a saver, and has good credit card behaviors. Once again these results follow the idea that risk tolerance involves not only the willingness to take on the risk but also the financial ability to take on the risk.

Conclusion

Understanding how a person's perception of their financial risk tolerance can affect how they behave financially. This paper is an attempt to understand how the respondents of the 2009 FINRA data set behave based upon their willingness to take on risks. Financial risk tolerance is a complex subject that incorporates an individual's willingness to take on the risk and also includes their capacity to take on the risk (Hanna, Waller, Finke, 2011). This capacity component of the paper was prominent throughout the results.

A person's willingness to take on risks was only significant when looking at if the respondent has an emergency fund. Those who are more willing to take on risks are also probably the type of people who should look at having a safety net in the form of emergency funds. Also, those who are more risk seeking with their finances have also likely accumulated more wealth and are then more likely to be able to have an emergency fund.

Owning a home, being a saver, and having good credit card behaviors were not affected by a person's risk score. Owning a home may not be determined by a person's willingness to take on risks because it is seen as a generally safe investment. It is a long term purchase and in order to be able to

purchase a home, one must have adequate funding. Therefore, owning a home may not be affected by a person's willingness to take on risks but rather more so their capacity to take on the risk. Income is positive and significant; those who have more money are increasingly more likely to own a home.

Being a saver is also not affected by a respondent's willingness to take on risks. While it is expected that saving should be similar to having an emergency fund, it may be a more general term that people of all risk levels are concerned with. The descriptive statistics show that over 80 percent of the sample is considered a saver suggesting that regardless of risk, people are savers. Income has a large impact in the model, again suggesting that in order to be able to save one must have enough money to do so.

Finally, risk had no effect on having good credit card behavior. The average credit card behavior score was less than 2 which suggests that people have fairly good credit card behaviors. Credit cards may not be viewed as a risky financial tool because they are so widely used. Income once again had a large effect on a respondent having a good credit card behavior. This again is likely due to their ability to pay off their balance each month and avoid late fees.

Financial literacy positively affected whether or not the respondent owned a home and their credit card behavior. It is likely that respondents who own a home or who have a credit card have done some of the calculations and understand the concepts that the questions cover in the survey. People with an emergency fund or those who are savers may not have taken the time or have had practice with many of the calculations asked in the FINRA survey.

To look at whether or not answering a specific question increased the likelihood of a respondent engaging in one of the financial behaviors separate regressions were run that replaced the financial literacy score with dummy variables for correct answers for each of the questions. Results showed that the individual financial literacy questions did not affect having an emergency fund or being a saver. However, answering the inflation and mortgage questions correctly increased the likelihood of owning a home and answering the bond and stock questions correctly increased the likelihood of having good

credit card behaviors. Individuals who have bought a house and have good credit card behaviors are more likely to have done the calculations or understand the concepts that helped the individuals answer the questions correctly.

A limitation of the study is the presence of possible endogeneity. Those who are more risk tolerant are more likely to have an emergency fund but are those who have an emergency fund more likely to be risk tolerant because there is some sort of backing in case one of the risks does not go as expected. Therefore, the issue of reverse causality needs to be looked at in future research. Also, owning a home, being a saver, and having good credit card behavior may not be behaviors that are related to risk and different behaviors need to be looked at which may be more affected by risk.

Future research should extend the financial behaviors to look at other areas that risk may affect one's behavior. Those behaviors could include having different insurances, planning for retirement, or other investment behaviors. Understanding how people behave under uncertainty and based upon their perceptions of their financial risk tolerance can aid financial advisors. It is important to maximize a person's investment and that depends not only on their willingness to take on the risk but also their capacity. This idea was seen throughout the paper, that even though a person's willingness to take on risks was not effective in determining whether they behaved a certain way, their income and financial literacy, or capacity to take on the risk, was a key component. This is an important implication that the capacity to take on risk was a larger determinant of the financial behaviors than the willingness to take on the risk.

References

Bhargava, Vibha, and Jean M. Lown. "Preparedness for Financial Emergencies: Evidence from the Survey of Consumer Finances." Association for Financial Counseling and Planning Education. (2006): 17-26. Print.

Bi, Lan, and Catherine P. Montalto. "Emergency funds and alternative forms of saving." *Financial Services Review*. 13. (2004): 93-109. Print.

Black, S. E., & Morgan D. P. "Risk and the democratization of credit cards." New York: Federal Reserve Bank of New York. Working Paper (June 1998).

Faff, Robert, Daniel Mulino, and Daniel Chai. "On the Linkage between financial risk tolerance and risk aversion." Journal of Financial Reseach. XXXI.1 (Spring 2008): 1-23. Print.

Finke, Michael S., and Sandra J. Huston. "The Brighter Side of Finanical Risk: Financial Risk Tolerance and Wealth." *Journal of Family and Economic Issues*. 24.3 (Fall 2003): 233-256. Print.

Fisher, Patti J., and Catherine P. Montalto. "Loss Aversion and Saving Behavior: Evidence from the 2007 U.S. Survey of Consumer Finances." Journal of Family Economic Issues. 32. (2011): 4-14. Print.

Grable, John E. "Financial Risk Tolerance and Additional Factors that Affect Risk Taking in Everyday Money Matters." Journal of Business and Psychology. 14.4 (Summer 2000): 625-630. Print.

Grable, John E. 2008. Risk Tolerance. In Handbook of consumer finance research, ed. J. J. Xiao, 3–19. Springer.

Hallahan, Terrence A., Robert W. Faff, and Michael D. McKenzie. "An Empirical Investigation of Personal Financial Risk Tolerance." *Financial Services Review*. 13. (2004): 57-78. Print.

Hanna, Sherman D., Waller, William and Finke, Michael S., The Concept of Risk Tolerance in Personal Financial Planning (September 6, 2011). Available at SSRN: http://ssrn.com/abstract=1923409 or http://dx.doi.org/10.2139/ssrn.1923409

Hartog, Joop, Ada Ferrer-i-Carbonell, and Nicole Jonker. "Linking Measured Risk Aversion to Individual Characteristics." Kyklos. 55.1 (2002): 3-26. Print.

Huston, Sandra J., and Y. Regina Chang. "Adequate emergency fund holdings and household type." Association for Financial Counseling and Planning Education. (1997): n. page. Print.

Joo, So-hyun, and John E. Grable. "An exploratory framework of the determinants of financial satisfaction." Journal of Family and Economic Issues. 25.1 (2004): 25-50. Print.

Palsson, Anne-Marie. "Does the degree of relative risk aversion vary with household characteristics?." Journal of Economic Psychology. 17. (1996): 771-787. Print.

Roszkiwski, Michael J., Geoff Davey, and John E. Grable. "Insights from Phsychology and Psychometrics on Measuring Risk Tolerance." *Journal of Financial Planning*. 18.4 (April 2005): 66-77. Print.

Roszkowski, Michael J., and John Grable. "Estimating Risk Tolerance: The Degree of Accuracy and the Paramorphic Representations of the Estimate." Association for Financial Counseling and Planning Education. 16.2 (2005): 29-47. Print. 26 Feb. 2013.

Schubert, Renate, Martin Brown, Matthias Gysler, and Hans Wolfgang Brachinger. "Financial Decision-Making: Are Women Really More Risk-Averse." Gender and Economic Transactions. 89.2 (May 1999): 381-385. Print.