



RISKY BUSINESS: SEX AND FINANCIAL DECISION-MAKING

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Introduction

According to a 2018 IMF report, women make up less than 20% of board seats and only 2% of chief executive officers in United States financial institutions (Sahay, 2018). But this underrepresentation doesn't only exist at the top leadership. From management positions to junior analysts, women in finance is severely lacking. Based on a study from the UC Davis Graduate School of Management, women account for only 18% of jobs in financial services, which is even less than women in jobs in STEM fields (Hooker, 2018).

These gender disparities exist for numerous reasons. One of potential reason is the misconception that women are not as "fit" for financial services as men, due to the myth that they are either more risk averse than men and miss out on high risk, high yield investments, or that they are not capable enough to handle these kinds of risky investments (Pilcher, 2014). Two serious consequences emerge from this claim. The first is that women are not given the opportunity for higher yield investments:

Anecdotal evidence from financial firms suggests that similar stereotyping by investment brokers is possibly disadvantageous to female clients. Women are expected to be more conservative investors than men and are consequently offered investments with lower risk and therefore lower expected returns (Schubert et al, 1999).

The second is that the claim is a major contributor to the "glass ceiling" that women face climbing the corporate ladder in finance, as well as additional challenges women face breaking into the industry (Schubert et al, 1999). These reasons inspired the following analysis and report on sex and the effect on financial risk aversion.

This research project will investigate this claim by using the 2016 Survey of Consumer Finances (SCF). The 2016 SCF reports the total market value of investments that respondents have and also the asset classes the investments fall into. I look into the asset allocation of the respondents based upon three of the asset classes, all having distinctly different levels of risk. U.S. treasury bonds, the first asset class, have the lowest level of financial risk of the three classes because the U.S. government has a 0% default rate. Mutual funds, the second class, typically have a medium amount of financial risk because they are diversified funds made up of different instruments with different risk levels. Thus, they level out the amount of financial risk as a collective mutual fund. The third asset class, individual stocks or equities, has the highest

risk of the three because it is dependent solely on one publicly traded company and therefore much more susceptible to changes in value.

I take the three asset classes and analyzes them as portions of the respondent's portfolio, known as their asset allocation. The asset classes are measured as total market value in 2016 dollars divided by total market value in 2016 dollars of the respondent's total amount invested in the three asset classes. Also included in the SCF is a self-reported willingness for financial risk question which is measured by the respondent rather than total market value in 2016 dollars. The responses to the above four questions provide a risk profile of each respondent and their level of risk aversion. Then several OLS regressions are performed to measure if sex has an impact on the respondent's level of risk aversion when it comes to financial decision-making and asset allocation.

In a general sense, women are more risk-averse than men due to the lack of a specific context. But a specific context and information about a context is provided, as it does when it comes to financial decision making, any statistically significant differences in risk aversion based solely upon sex do not exist. Including other relevant variables in the analysis, such as race, age, marital status, number of dependents, and level of education, provides a more comprehensive analysis of the relationship between sex and risk aversion, and then all of these variables become subject to statistical significance.

Literature Review

There is a large body of work surrounding the topic of financial risk aversion and sex. The following are the most pertinent ideas. Scholars that believe that sex has an impact on risk aversion cite either evolution or socialization as the cause. Other scholars are more critical of previous studies and call into question the methods and context the study was done, specifically the methods and confounding variables. These confounding variables include marital status, age, race, income, and level of education. A smaller but significant body of work claim that these variables are crucial to any analysis on sex and decision making, and that these variables are potentially even more determinant.

It's important to note some of the research regarding general differences in levels of risk aversion between men and women before moving into differences in levels of risk aversion specifically for financial investments. Harris (2006) broke down risk into four categories: gambling, health, recreational, and social and then asked them to rate the likelihood of them engaging in that activity, the probability of negative consequences because of the risky behavior, how severe the potential consequences would be, and how enjoyable the activity would be if there were no negative consequences (Harris, 2006). The authors find that the women surveyed rated the risky activities in gambling, health, and recreational as more likely that negative outcomes would occur, the negative consequences would be more severe, and rated lower enjoyment for risky behaviors (Harris, 2006). This study provides a valuable insight other studies regarding gender and risk aversion haven't—a fifth category of risk—social risk—that includes the possibility of substantial positive gain with a relatively low probability of negative outcomes that are known (Harris, 2006). For this category, women responded positively (Harris, 2006).

The authors think the reasons behind this phenomenon are evolutionary: men have lower risk of not reproducing in that they can mate with multiple partners at a time and produce multiple offspring at once, but women cannot (Harris, 2006). Additionally, they think it is evolutionary in that women have been responsible for the protection and development of their offspring when their offspring are vulnerable (Harris, 2006). The findings of this study regarding evolutionary arguments for general risk aversion by sex are crucial to set the context for financial risk aversion. These findings provide cause for the existing claims, discussed in the introduction, that women are more risk conservative investors or that they cannot handle high risk investments.

Eckel and Grossman (2002) also hypothesize a possible evolutionary approach when it comes to risk aversion by gender leading to differences in asset allocation. Parenting, which, evolutionarily speaking, would be in a woman's domain, can be best described as low-risk and steady-return. This is because parenting often involves keeping children in safe, consistent, and comfortable environments rather than putting them in risky or dangerous situations. For example, for women responsible for taking care of the young and vulnerable, fluctuations in food could result in dire consequences so there is a preference for consistency (Eckel and Grossman, 2002). Meanwhile, men were more evolutionarily concerned with mating with as many females as possible and producing the most offspring possible (Eckel and Grossman, 2002). In order to

compete with other males for reproduction with males, males would often have to engage in risky behaviors to appear as a more attractive mate for reproduction (Eckel and Grossman, 2002). These efforts could include difficult physical feats or other dangerous behaviors to prove that they have traits that make them worthwhile mates. If their efforts were successful, the risky behaviors would be rewarded greatly. When this logic is applied to investing, it makes sense that women are less likely to invest in risky and volatile investments and men are more comfortable with the risk.

Their study involved gambling choices of men and women of the same demographics. Participants were given \$6 for completing the survey to make them feel like they had earned the \$6 (to mimic how they earn money from a job) and then were asked a series of gambling choices (Eckel and Grossman, 2002). For each gambling choice, there was a 50% probability of gaining money, but as the choices progressed there was the same probability of losing money. The most risk-averse individual would only choose to gamble one time, since there was no option to not gamble at all. A moderately risk-averse individual would choose to gamble two to four times. The least individual would choose to gamble all five times, to the point that they would risk losing money. The study found that women were significantly more risk-averse than men (Eckel and Grossman, 2002). For the least risky option (gambling only once) women accounted for about 8% while men accounted for less than 2%. Meanwhile, over one-third of men and only 13% of women chose the riskiest option-- gambling all five times (Eckel and Grossman, 2002).

This study indicates a typical gambling experiment with results showing that women are more risk averse than men. This study lacks two elements. The first being that the individuals in the study aren't gambling with their own money, but rather \$6 that was given to them in the study. Respondents could be acting differently since they don't necessarily have the emotional attachment to the \$6 given to them than their own hard-earned income. Secondly, the study lacks any information about the gamble/choice respondents are making. When it comes to investing, even though it is still ultimately a gamble, there is a plethora of information available to make a rational choice. Women, thus, could become less risk averse if the gamble was framed more as actual investment choices rather than just random gambles. This calls into question the level of education or information on the gamble, and also the exact context of the situation to better explain the relationship between sex and financial risk aversion.

Schubert, Brown, Gysler and Brachinger (1999) focus on the context and framing of the choices. They ask graduates from the University of Zurich two types of surveys: one an abstract study, asking respondents whether they are more focused on gain-gambling or loss-gambling and two a contextual study, asking respondents whether they choose investment or insurance (Schubert et al., 1999). The results show that in the abstract, without a specific context, women are much more risk-averse than their male counterparts (Schubert et al., 1999). But in the contextual study, there were no statistically significant differences between the choices of investment or insurance made by men and women (Schubert et al., 1999). This is a very important finding. It shows that without a specific context in which decisions are being made, there is a greater likelihood that women follow evolutionary patterns and become more risk averse. But this study also shows that with a specific context that choices are being made, women are able to overcome evolutionary instincts of risk aversion.

Finally, the last pertinent theme of the literature investigating sex and financial risk aversion is the importance of other confounding variables such as race, age, marital status, and level of education. A study from Jianakoplos and Bernasek breaks down investment choice by sex and analyzes its effect on financial risk aversion with age, race, and marital status. The study also uses the Survey of Consumer Finances from the New York Federal Reserve, but the data is from one of the earliest surveys in 1989. First analyzing age and marital status, they find that single, young women are the most risk averse compared to young, single men and married couples. But once above the age of 35 or so, married couples become more risk-averse than both single men and single women with lower ratios of risky assets held. Then holding marital status constant, single men continue to have higher ratios of risky assets than single women throughout their lifetimes. As for race, single, black women disproportionately hold riskier assets than single white women (Jianakoplos and Bernasek, 1998).

Their study goes into more detail about the other confounding variables such as race and education level that will be investigated in this study. Though Jianakoplos and Bernasek (1998) provide a more thorough understanding of the role sex plays when it comes to financial decision making and the confounding variables analyzed better explain the differences in magnitude that each variable has on financial risk aversion, there are some issues with their study. Their analysis used U.S. 1988 dollars instead of percentages of the total respondent's investment portfolio. The issue in this method is that different groups (men, women, black women, white women, etc.)

typically have different levels of wealth and income to invest into financial markets. For example, a man could have more money to invest than a woman; even though only 5% of his portfolio is in individual stocks, there could be a higher monetary value than a woman who has a portfolio of 50% individual stocks but a lesser monetary value.

Based on the most pertinent ideas in the literature on sex and risk aversion, both financial and not, there appear to be a few gaps that this analysis aims to accomplish. Each study in the review provides valuable information but none include the exact structure and methods this study aims for. The first is that not all of the studies analyze the financial decision making that includes money the participants in the study earned themselves. This creates an issue of lack of emotional attachment to those funds. Secondly, not all of the experiments are structured in a way that there is a lot of information available regarding the decision they are making. Therefore, financial decision making in this way doesn't parallel investing in financial markets, where there is a plethora of information available. Finally, most studies analyzing the effect of sex on financial risk aversion do so in U.S. dollars invested in asset classes of different risk rather than portions of the individual's portfolio in certain asset classes of differing risk. Therefore, this study is conducted measuring income money that is actually owned by the individual, there is readily available information regarding investments, and the analysis measures the effect of sex on portions of an individual's portfolio versus the amount of money invested.

Methods

The data is from the 2016 Survey of Consumer Finances (SCF) conducted by the Board of Governors of the Federal Reserve System. This data is from the 2016 iteration of the survey. The data is at the individual level. The data is available to download online from the Federal Reserve system and is available as both an Excel file and Stata file.

The variables analyzed in this analysis from the SCF data are as follows.

Table 1: Variables

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Name	Description	Units	Type	
Sex	Respondent's sex. 0 if male, 1 if female	M/F	Categorical	
Race	Respondent's race. 0 if white, 1 if non-white	Race	Categorical	
Age	Respondent's Age	Years	Continuous	
Marital Status	If the respondent is married. 0 if unmarried, 1 if married	Y/N	Categorical	
Number of Dependents	Number of dependents that the respondent has	People	Discrete	
Level of Education	Level of education respondent has received on a scale	Scale	Ordinal	
Financial Risk Willingness	Respondent's self-reported willingness for financial risk	Scale	Categorical	
TMV Bonds	Total market value respondent has invested in U.S. treasury bonds	U.S. dollars in 2016	Continuous	
TMV Mutual Funds	Total market value respondent has invested in mutual funds	U.S. dollars in 2016	Continuous	
TMV Stocks	Total market value respondent has invested in individual, publicly traded equities (stocks)	U.S. dollars in 2016	Continuous	
Total Amount	Total market value respondent has invested in all three asset classes. Calculated by TMV Bonds+ TMV Mutual Funds+ TMV Stocks	U.S. dollars in 2016	Continuous	
Percent Bonds	Percent of respondent's portfolio in U.S. treasury bonds. Calculated by TMV Bonds/Total Amount	Percentages	Continuous	
Percent Mutual Funds	Percent of respondent's portfolio in mutual funds. Calculated by TMV Mutual Funds /Total Amount	Percentages	Continuous	
Percent Stocks	Percent of respondent's portfolio in individual stocks. Calculated by TMV Stocks /Total Amount	Percentages	Continuous	

The limitation of the data is self-reporting bias. This is a very extensive survey. Individuals can choose to opt out of it which might skew the results to certain demographics. It might also introduce bias as there are no controls to account for individual-level biases. The ideal data set would be where the same question is asked multiple times in deferent forms so that the variations in answers can be used as quality control.

The following are the summary and descriptive statistics of the variables being analyzed.

Table 2.1: Summary Statistics for Categorical Variables

Table 2: Summary Statistics for Categorical Variables					
Variable	Subcategory	Observations		Percent	Mode
Sex	Men	9226	8104	87.84	Men
	Women		1122	12.16	
Race	White	9226	8127	88.09	White
	Non-White		1099	11.91	
Marital Status	Not Married	9226	2514	27.25	Married
	Married		6712	72.25	
Level of Education	1st, 2nd, 3rd, or 4th grade	9226	5	0.05	Bachelor's Degree
	5th or 6th grade		5	0.05	
	7th and 8th grade		15	0.16	
	9th grade		35	0.38	
	10th grade		30	0.33	
	11th grade		20	0.22	
	12th grade, no diploma		71	0.77	
	High school graduate - diploma		843	9.14	
	Some college but no degree		786	8.52	
	Associate's degree - occupational		287	3.11	
	Associate's degree - academic		336	3.64	
	Bachelor's degree		3319	35.97	
	Master's Degree		2052	22.24	
	Professional school degree		1422	15.41	

Table 2.2: Summary Statistics for Categorical Variables

Table 2: Summary Statistics for Categorical Variables				
Variable	Subcategory	Observations	Percent	Mode
Financial Risk Willingness	-1 (Not all all willing to take financial risks)	211	2.29	7
	1	146	1.58	
	2	376	4.08	
	3	654	7.09	
	4	730	7.91	
	5	1513	16.4	
	6	1435	15.55	
	7	1759	19.07	
	8	1275	13.82	
	9	390	4.23	
	10 (Very willing to take risks)	737	7.99	

Table 3: Summary Statistics for Continuous and Discrete Variables

Table 3: Summary Statistics for Continuous and Discrete Variables						
Variable	Observations	Mean	Standard Deviation	Min	Median	Max
Age	9226	58.21	14.58	19	59	95
Number of Dependents	9226	1.23997	2.008564	-1	2	10
TMV Bonds	9226	\$89689.5	\$1515171	\$0	\$0	\$5.20E+07
TMV Mutual Funds	9226	\$3729128	\$1.98E+07	\$0	\$30000	\$5.22E+08
TMV Stocks	9226	\$4432818	\$3.19E+07	\$0	\$28000	\$1.00E+09
Percent Bonds	9226	0.56%	6.05%	0.00%	0.00%	100%
Percent Mutual Funds	9226	45.69%	44.80%	0.00%	40.52%	100%
Percent Stocks	9226	53.75%	44.78%	0.00%	57.06%	100%

A few things of note from the summary statistics in Table 2 regarding the demographics of those surveyed in the SCF 2016. The first is that the survey is 88% male. According to the SCF Codebook, this does not mean that 88% of the respondents were male. Rather, it means that men are the ones making the financial decisions for 88% of the households surveyed, including

all subcategories of the marital status variable. Secondly, the respondents of this survey are predominantly white—almost 90%. This could lead to skewed results because the racial demographics are not representative to that of the United States. Additionally, respondents are much more likely to be married. This would lead me to hypothesize that the social divisions of labor in a marriage could have more of an effect on financial decision making than that of single or otherwise unmarried individuals. Over a third of respondents have a bachelor's degree, with the other two most frequent subcategories of education being attainment of a master's degree or other professional school degree such as MD or JD. Finally of note is the age demographic. The average respondent to this survey is around 58 years old which is very close to the typical retirement age in the United States.

This is important because most Certified Financial Planners (CFPs) reduce the level of risky assets an individual has in their portfolio as they get closer to retirement age. The closer an individual is to retirement, the less amount of time they have to recover any lost assets (assuming they plan to live off of their investments after retiring). This factor may or may not cause a skewed result, depending first, if the individual uses a CFP and two, depending on the rate they use their investment income to live on.

OLS Regression Parameters

For the analysis on the four dependent variables: Financial Risk Willingness, Percent Bonds, Percent Mutual Funds, and Percent Stocks, the OLS regressions will begin with just an analysis of sex and the dependent variable, and then the independent variables listed above will be added one by one to the regressions until all are accounted for. The purpose of this is to watch the change of the effect of the existing independent variables as new independent variables are added. Further in this analysis there are charts showing this. For the purposes of the OLS Regression Parameters, only the equations that I think are most important are shown below.

Financial Risk Willingness

$$\text{Financial Risk Willingness} = \beta_0 - \beta_1 \text{Sex} - \beta_2 \text{Race} - \beta_3 \text{Age} + \beta_4 \text{Marital Status} + \beta_5 \text{Dependents} + \beta_6 \text{Education} + \mu_i$$

Since financial risk willingness is self-reported and thus is related to the respondent's confidence and level of comfortability, this analysis hypothesizes that sex and race will decrease the

respondent's financial risk willingness, due to the perception that finance and business are fields of study reserved for white men. This analysis also predicts that age could have a negative relationship with financial risk willingness as investors become closer to retirement age and have greater need for their investment income. Finally, this analysis predicts that number of dependents will have a negative relationship due to how growing families typically need more financial stability.

Percent Bonds

$$\text{Percent Bonds} = \beta_0 + \beta_1 \text{Sex} + \beta_2 \text{Race} + \beta_3 \text{Age} + \beta_4 \text{Marital Status} + \beta_5 \text{Dependents} + \beta_6 \text{Education} + \mu_i$$

Since the variable Percent Bonds (asset class: U.S. Treasury Bonds) has the lowest level of financial risk of the three, this analysis predicts that sex could have a positive relationship with Percent Bonds if the claim that women are more risk averse is accurate. This analysis also predicts that a positive relationship could form if a woman is married and has children—due to the need for more stability—but that there is a negative relationship if the woman is married without dependents, assuming she has two incomes in the household. Finally, this analysis predicts that age will have a positive relationship as individuals get closer to retirement.

Percent Mutual Funds

$$\text{Percent Mutual Funds} = \beta_0 + \beta_1 \text{Sex} + \beta_2 \text{Race} + \beta_3 \text{Age} - \beta_4 \text{Marital Status} + \beta_5 \text{Dependents} + \beta_6 \text{Education} + \mu_i$$

Since mutual funds have the medium amount of risk of the three variables/asset classes, the analysis predicts that the relationships could be mixed among the independent variables. This analysis predicts that age could have a positive relationship holding sex, race, marital status, number of dependents, and level of education constant. Also, this analysis predicts that marital status could have a negative impact because having two incomes makes a household more financially stable, potentially making them more likely to invest in riskier assets.

Percent Stocks

$$\text{Percent Stocks} = \beta_0 - \beta_1 \text{Sex} + \beta_2 \text{Race} - \beta_3 \text{Age} + \beta_4 \text{Marital Status} - \beta_5 \text{Dependents} + \beta_6 \text{Education} + \mu_i$$

Stocks are the riskiest asset class, leading this analysis to predict that age and dependents will have a negative relationship due to the need for stability for someone with children or someone living off their investment income as a retiree. Following the claim that women are more financially risk averse than men, this analysis predicts that sex will have a negative relationship with stocks. This analysis also predicts that marital status, holding dependents and the other independent variables constant, could have a positive relationship, given that two incomes in a household could make it more financially stable and make it more possible to invest in riskier assets. The greater the level of education could make create a positive relationship with stocks given that these individuals would be able to better research the stocks they're investing in, and also that people with higher levels of education typically have higher incomes and wealth.

Results

Analysis on Sex and Financial Risk Willingness

Below is Table 1, showing the results of a respondent's self-reported financial risk willingness regressed with sex and the other independent variables: race, age, marital status, number of dependents, and level of education. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.01$

Table 4:
OLS
Estimates of
Financial
Risk
Willingness

<p>TABLE 4</p> <p>OLS Estimates of the Effect of Sex, Marital Status, Number of Dependents, and Level of Education on Financial Risk Willingness</p> <p>Dependent Variable: Self-Reported Financial Risk Willingness from SCF 2016</p>									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	-				-	-	-	-	
Sex	1.561*** (0.0807)	-1.567*** (0.0806)	-1.508*** (0.0796)	-1.510*** (0.0796)	1.597*** (0.0974)	1.587*** (0.0970)	1.565*** (0.0805)	1.439*** (0.0791)	-1.430*** (0.0955)
Race		0.183** (0.0751)		0.0339 (0.0770)					0.0365 (0.0760)
Age			- 0.0151*** (0.00181)	- 0.0149*** (0.00186)					- 0.0214*** (0.00236)
Marital Status					-0.0451 (0.0668)	-0.0276 (0.0667)			-0.104 (0.0674)
Number of Dependents						- 0.0277** (0.0119)	- 0.0283** (0.0120)		0.0839*** (0.0154)
Level of Education								0.166*** (0.0144)	0.174*** (0.0145)
Constant	6.166*** (0.0255)	6.145*** (0.0269)	7.038*** (0.104)	7.025*** (0.109)	6.203*** (0.0606)	6.224*** (0.0615)	6.202*** (0.0280)	4.216*** (0.175)	5.332*** (0.204)
Observations	9,226	9,226	9,226	9,226	9,226	9,226	9,226	9,226	9,226
R-squared	0.046	0.046	0.054	0.054	0.046	0.046	0.046	0.065	0.077

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 1 shows that sex has a statistically significant, negative effect across all columns on self-reported willingness to make financially risky decisions, but the magnitude of this negative effect decreases when controlling for race, age, marital status, number of dependents, and level of education. Controlling for only marital status causes sex to have the biggest impact on financial risk willingness. Column 5 shows that women are 160% less willing to make financial risks than men, but the magnitude is reduced to women only being 144% less willing to make financial risks when controlling for level of education in Column 8. Controlling for age also reduces the impact sex has, making women 156% less willing to make financial risks to 151% less willing to make financial risks. Age also has a statistically significant impact on the willingness to make financial risks, making women about 1.5-2% less willing to make financial risks than their male counterparts. Though these effects are statistically significant, they are not very significant in a practical sense given that financial risk willingness is only measured on a ten-point scale in this survey. Number of dependents also has a small but statistically significant, negative effect (about 3%) in Columns 6 and 7, but then has a statistically significant, positive relationship of about 8.4% when controlling for sex, age, race, marital status, and level of education in Column 9. This is interesting considering the sign of the coefficient is flipped when controlling for the other confounding variables, but again is not very practically significant given that these percentages are in the single digits and financial risk willingness is measured from 1-10.

Analysis on Sex and Portfolio Investments in U.S Treasury Bonds

Below is Table 2, showing the results of the proportion of U.S. treasury bonds in a respondent's portfolio (Percent Bonds) regressed with sex and the other confounding, independent variables: race, age, marital status, number of dependents, and level of education. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5: OLS Estimates of U.S. Treasury Bonds

TABLE 5	OLS Estimates of the Effect of Sex, Race, Age, Marital Status, Number of Dependents, and Level of Education on Proportion of Portfolio Investments in U.S. Treasury Bonds								
	Dependent Variable: Proportion of Portfolio Investments in U.S. Treasury Bonds from SCF 2016								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sex	0.000770 (0.00225)	0.000888 (0.00225)	0.000375 (0.00223)	0.000512 (0.00224)	-0.00517 (0.00338)	-0.00545 (0.00335)	0.000861 (0.00225)	0.00120 (0.00225)	-0.00588* (0.00343)
Race		-0.00384*** (0.00116)		-0.00285** (0.00123)					-0.00338** (0.00132)
Age			0.000113*** (4.35e-05)	9.91e-05** (4.52e-05)					9.20e-05* (5.33e-05)
Marital Status					-0.00740*** (0.00274)	-0.00789*** (0.00269)			-0.00882*** (0.00270)
Number of Dependents						0.000772** (0.000324)	0.000612* (0.000341)		0.000368 (0.000399)
Level of Education								0.000581* (0.000340)	0.000802** (0.000340)
Constant	0.00549*** (0.000654)	0.00593*** (0.000715)	-0.00105 (0.00250)	9.34e-05 (0.00269)	0.0116*** (0.00270)	0.0110*** (0.00276)	0.00472*** (0.000773)	-0.00135 (0.00404)	-0.00206 (0.00412)
Observations	9,226	9,226	9,226	9,226	9,226	9,226	9,226	9,226	9,226
R-squared	0.000	0.000	0.001	0.001	0.002	0.003	0.000	0.000	0.004

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Sex and U.S. Treasury Bonds continued...

According to Table 2, sex alone only has a statistically significant impact on the proportion of U.S. treasury bonds in an individual's portfolio when holding all the confounding variables constant. Even then it only has a p-value of 0.1 which is twice as large as the typical, industry used p-value of 0.05. In this column, Column 9, it shows that sex only decreases the proportion of treasury bonds by 0.6%. Though this is statistically significant, it is not very practically significant, given that 0.6% of the mean of total market value of U.S. treasury bonds is \$538. Age is also statistically significant but not practically significant, only increasing the portion of U.S. treasury bonds by 0.01% which is only about \$9. Marital status has a statistically significant, negative effect the portion of bonds held, about 0.8-0.9%. This is about \$718-808 and therefore not very practically significant compared to the mean market value of bonds held among the respondents in this survey.

Analysis on Sex and Portfolio Investments in Mutual Funds

Below is Table 3, showing the results of the proportion of the respondent's portfolio in mutual funds (Percent Mutual Funds) regressed with sex and the other independent variables: race, age, marital status, number of dependents, and level of education. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6: OLS Estimates and Mutual Funds

TABLE 6 OLS Estimates of the Effect of Sex, Race, Age, Marital Status, Number of Dependents, and Level of Education on Proportion of Portfolio Investments in Mutual Funds									
Dependent Variable: Proportion of Portfolio Investments in Mutual Funds from SCF 2016									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sex	-0.00715 (0.0149)	-0.00397 (0.0149)	-0.0142 (0.0149)	-0.0100 (0.0149)	0.0469** (0.0182)	0.0444** (0.0182)	-0.00594 (0.0149)	0.0133 (0.0151)	0.0402** (0.0183)
Race		-0.103*** (0.0143)		-0.0872*** (0.0147)					-0.0858*** (0.0146)
Age			0.00202*** (0.000324)	0.00159*** (0.000333)					0.00140*** (0.000410)
Marital Status					0.0673*** (0.0130)	0.0629*** (0.0131)			0.0363*** (0.0131)
Number of Dependents						0.00690*** (0.00236)	0.00817*** (0.00235)		0.00141 (0.00294)
Level of Education								0.0278*** (0.00232)	0.0274*** (0.00234)
Constant	0.458*** (0.00494)	0.470*** (0.00521)	0.341*** (0.0193)	0.376*** (0.0203)	0.402*** (0.0118)	0.397*** (0.0119)	0.448*** (0.00577)	0.131*** (0.0278)	0.0327 (0.0348)
Observations	9,226	9,226	9,226	9,226	9,226	9,226	9,226	9,226	9,226
R-squared	0.000	0.006	0.004	0.008	0.003	0.004	0.001	0.015	0.025

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Sex and Mutual Funds continued...

According to Table 3, sex is only statistically significant when controlling for marital status (Column 5,6, and 9). The magnitude of the effect sex has on proportion of mutual funds is actually the largest in these columns though, and therefore the most practically significant with women having 4-4.7% more mutual funds in their portfolio than men, holding marital status constant. Though these seem like small percentages, they are practically significant in the context of the mean market value of mutual funds held by the respondents in this survey. The effect sex has on mutual funds, holding marital status constant, relates to about \$150,000-175,000 more invested in mutual funds than their male, married counterparts. Additionally, race has a statistically significant impact on mutual funds in every column it is held constant (Columns 2, 4, and 9). Non-whites hold about 8.5-10% less mutual funds in their portfolios by portion compared to the other asset classes. The practical significance leads to a gap difference of between \$318,000 and \$373,000. Age is also very statistically significant with a positive relationship in every analysis it was held constant (Columns 3, 4, and 9). The practical significance of this debatable, given that it only increases the portion of mutual funds around 0.2% but contextually increases the amount of mutual funds invested by about \$7,500. Level of education also has a statistically significant effect with a positive relationship on percent mutual funds. In columns 8 and 9, having a higher level of education leads to about 2.8% more mutual funds in a woman's portfolio which yields about \$105,500 more, on average.

Analysis on Sex and Portfolio Investments in Individual Stocks

Below is Table 4, showing the results of the proportion of the respondent's portfolio in individual, publicly traded equities/stocks (Percent Stocks) regressed with sex and the other independent variables: race, age, marital status, number of dependents, and level of education. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7: OLS Estimates and Individual Stocks

TABLE 7 OLS Estimates of the Effect of Sex, Race, Age, Marital Status, Number of Dependents, and Level of Education on Proportion of Portfolio Investments in Individual Stocks									
Dependent Variable: Proportion of Portfolio Investments in Individual Stocks from SCF 2016									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sex	0.00638 (0.0149)	0.00309 (0.0149)	0.0138 (0.0149)	0.00950 (0.0149)	-0.0417** (0.0182)	-0.0389** (0.0183)	0.00508 (0.0149)	-0.0145 (0.0151)	-0.0343* (0.0184)
Race		0.107*** (0.0143)		0.0901*** (0.0147)					0.0892*** (0.0145)
Age			-0.00214*** (0.000323)	-0.00169*** (0.000333)					-0.00149*** (0.000410)
Marital Status					-0.0599*** (0.0130)	-0.0550*** (0.0131)			-0.0275** (0.0132)
Number of Dependents						-0.00767*** (0.00235)	-0.00879*** (0.00234)		-0.00178 (0.00293)
Level of Education								-0.0284*** (0.00232)	-0.0282*** (0.00234)
Constant	0.537** * (0.00494)	0.524*** (0.00520)	0.660*** (0.0193)	0.624*** (0.0203)	0.586*** (0.0119)	0.592*** (0.0120)	0.548*** (0.00577)	0.871*** (0.0278)	0.969*** (0.0347)
Observations	9,226	9,226	9,226	9,226	9,226	9,226	9,226	9,226	9,226
R-squared	0.000	0.006	0.005	0.009	0.002	0.004	0.002	0.016	0.026

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4 shows that sex only has a statistically significant impact on the portion of individual stocks when marital status is held constant in columns 5, 6 and 9. In these regressions, sex has a negative relationship and an effect of about 3.5-4% smaller portion of stocks than men, leading to a difference of about \$155,000-\$177,000. Race, age, marital status, and level of education are also statistically significant every column they are held constant. Race has a positive relationship of about 9-10% more proportion of their portfolios in individual stocks, which equals about \$400,000-443,000 relative to the mean of investments in stocks of the respondents of this study. Age has a negative relationship of about 0.15% to 0.2% smaller proportion of individual stocks in their portfolio, or about \$6,500-8,900. Marital status also has a negative relationship with individual stocks but this magnitude varies between 2.8% and 6% depending on the other confounding variables that are controlled for. When more variables are controlled, the magnitude decreases. Finally, level of education also has a negative relationship with a magnitude of about 2.8% or about \$124,000 less in individual stocks, the riskiest of the three asset classes.

Discussion

There are some very interesting findings from on the above analysis of sex, risk aversion, and preference for different asset classes based on the Survey of Consumer Finances from 2016. The first eye-catching component of the analysis is that, overall, sex alone is not a statistically significant determinant of financial asset choice based upon financial risk, as shown in Tables 5-7. It is very statistically significant, however, that women self-report their willingness to make financial risks to be much lower than men, as shown in Table 4. Why would women report that their financial risk willingness is lower than men, yet there are no significant differences, captured in this analysis, in how they invest in asset classes with different levels of financial risk?

There are a few answers proposed both in the literature and my own theories. Schubert et al (1999) proposes that any differences in financial risk taking between men and women, whether self-reported or not, are actually due to the “opportunity sets” between the two sexes rather than their innate risk aversion. In the United States today, women on average still earn less

than men, partially due to the gendering of certain fields that are high paying (engineering, finance, computer science) and that within certain fields in the U.S., there still exists a wage gap. Therefore, women self-report that they are less willing to make financially risky decisions compared to men because they, on average, don't have the same amount of money to invest as men, and thus think they have to be more conservative investors. This would lead the analysis to consider the income effect, and that the results in Tables 4-7 are really just capturing that—with one exception. For financial risk aversion and individual stocks (Tables 4 and 7), race has a statistically significant positive effect; therefore, non-whites rate themselves as more comfortable taking financial risks and have higher portions of stocks, the riskiest asset, in their portfolios. This would contradict the wealth effect because non-whites typically have lower incomes and wealth (Kochhar, 2018). Therefore, this analysis hypothesizes that there is a confidence factor taking place in this situation. In the United States, finance is still somewhat gendered towards men, whether it means finance as a field or just personal financial matters (Pilcher, 2014). Therefore, due to this socialization, women might not have the same confidence that men do when it comes to investing and therefore self-report a statistically significant lower willingness for risk.

For the financial asset classes, sex was not a statistically significant determinant in most of the columns. For U.S. government bonds, the least risky asset, sex is only a significant determinant when controlling for race, age, marital status, number of dependents, and level of education. Even where it is statistically significant, it has a negative effect. For the claim that women are more risk averse to hold true, there would have to be a positive effect since it is the least risky of the three asset classes. Therefore, the claim does not hold according to this analysis. Mutual funds follow a similar pattern, except also when only controlling for marital status and number of dependents. However, for mutual funds, holding marital status constant, the relationship is positive when the other columns of the analysis are negative. This highlights the importance of marriage when it comes to personal finance, specifically the social dynamics and expectations of the sexes in a marriage. My theory for this relationship is that due to the lack of confidence about personal finances single women may have or that finance as a field is so gendered, when they get married, their partner (typically a man because most marriages in this dataset are heterosexual) takes over their personal finances including their investment portfolio (Brown, 2018).

Overall, my results are consistent with my hypothesis that women are statistically significant more risk averse in general but lose the significance in a financial context because of how this risk is framed and the information available about these financial investments. My results are also consistent with my thesis in the importance of confounding variables: in this case, race, age, marital status, number of dependents, and level of education. Age and marital status appear to be the most predictable determinants of self-reported risk willingness and asset choice. In Tables 4-7 they were all statistically significant when controlling for just sex, but also significant when controlling with number of dependents and race as well. Age is the most straightforward. Due to the dependence most Americans have on their investment portfolios for their retirement income, as Americans get closer to retirement age, they choose assets with less risk so that they have more financial stability when they retire. Marital status also makes sense due to the social dynamics involved in heterosexual marriages in America. Level of education and number of dependents is also statistically significant for all three asset classes. Though many of these statistically significant findings may have small coefficients, many have a strong practical significance given the high means of total market value for the three asset classes. Differences of only a few percent lead to gaps of a few hundred thousand dollars.

Some of these findings are in line with the existing literature and some are not. Most of the existing literature says that women are risk averse, even former studies using Survey of Consumer Finance data, but these studies analyze investments by total market value instead of portions of portfolios (citation). But the effect and importance of the confounding variables—race, age, marital status, number of dependents, and level of education—are in line with existing literature (citation).

There are a few caveats to this study that are importance to consider. The first is that, even though it is portions of portfolios being analyzed, these proportions are derived from total market value. For example, an individual could've started out with 20% of their portfolio in stocks, but the total market value of those stocks could've significantly risen and therefore the proportion $\left(\frac{TMV\ Stocks}{TMV\ Stocks+TMV\ Mutual\ Funds+TMV\ Bonds}\right)$ can go up even though they did not buy more shares of stock. The second is that there could be a wealth effect that some of the confounding variables are partially capturing, though this analysis does not think this is occurring. The final caveat is that there are varying levels of risk within each of these asset classes. For example, an individual could be invested in a mutual fund (that are typically seen as medium risk) but the

fund could be made up of very risky assets such as growth technology stocks or low grade corporate bonds. An individual could also be invested in individual stocks, that, as an asset class are the riskiest, but the stocks themselves could be value stocks like Johnson & Johnson that have a history of low volatility. Therefore, the risk assessment is not perfect on a granular level.

Conclusion

The claim that women are more risk averse than men when it comes to financial decision making has been pervasive in the financial services industry for decades and a subsequent result in a severe lack of women in the industry. Some writers within the industry predict that if there were more women in financial services in the 2000s, the financial crisis of 2007-2009 might not have occurred—or if it did, it would've been much less severe (Newton-Small, 2016). After analyzing the proportions of an individual's portfolio in U.S. treasury bonds, mutual funds, and individual publicly traded equities based upon survey data from the 2016 SCF to investigate if women are more risk averse investors, the conclusion of this analysis is that there is no statistically significant difference in financial risk aversion between men and women when it comes to the actual portions of their portfolios by asset. There is a statistically significant difference, however, when it comes to self-reported finance risk willingness, which leads this analysis to hypothesize that there is a confidence issue. Though there are no explicit policy recommendations following this analysis, efforts should be made in schools, by nonprofits and even financial institutions, and by families to help women become more confident in their financial abilities. With more gender equality in the financial services industry, worldwide financial systems could become more stable and the world might never have to face a financial crisis so severe again.

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