The Effects of Risk Tolerance on Investment Search Behavior

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INTRODUCTION

Information search is a common behavior initiated by individuals to obtain beneficial information for their decision-making. Like most economic behaviors, search behavior has both uncertain benefits and costs for the individual, where the cost can be both monetary and the opportunity cost of time used. Determining an optimal amount of searching behavior, therefore, becomes another economic choice an individual must face when making decisions. Risk tolerance is an essential factor for individuals' decision-making process. It can affect the expected utility of the benefits from information search. Therefore, it may also affect the optimal amount of search.

We first provide a theoretical framework for possible mechanisms between risk tolerance and the financial searching behavior for investments. We use the 2016 Survey of Consumer Finances (SCF) dataset to ascertain how risk tolerance affects the level of search related to saving/investment decisions. The results suggest that the risk tolerance is positively related to investment search. These results support our hypothesized channels of risk tolerance on searching, that risk tolerance may be related with to both the amount of assets and the type of assets. When we add an interaction term between risk tolerance and the amount of assets, we also find the evidence for the third channel between risk tolerance and searching in that risk tolerance may also be related with the expected value loss. This paper also discusses the relationship between investment searching behavior and other variables, such as education attainment, financial knowledge, marital status, health status, and asset ownership.

THEORETICAL FRAMEWORK

For a simple exposition, we follow elements of Stigler's (1961) model, although the simplifying assumptions about rounds of search are not crucial. We assume that a representative individual is in the financial market and is facing an investment decision. Searching is to gather information from the current market. Given that the market is incomplete, the individual cannot obtain all of the information ex ante. For a simple exposition of this model, assume that the representative individual can only recognize the distribution of different financial investment goods. We also assume, following Stigler (1961), that "searching effort" is demonstrated by the rounds of search, rather than overall time used on search.

As in the original Stigler (1961) model, the individual needs to decide how much search to undertaken to maximize expected net benefits. In the simple model, each round of searching is assumed to take the same amount of time. The more financial knowledgeable the individual is, the more efficient the search is and the less time each round of search would cost. The monetary value

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for the cost of search would equal to the time used multiplied by the opportunity cost of unit time.

Investment goods can be separated into categories based on the risk premium each investment good offers. We assume that investments with a higher risk premium will have higher variance of investment returns, and therefore higher potential benefits from search. This assumption is plausible because less risky assets, such as a saving accounts have less variance of returns and fewer options than riskier assets, such as stock assets, which may have more products (e.g., direct stock investment, stock mutual funds, other financial derivatives), and more variant returns due to the risky attribute of the investment.

The theoretical framework is displayed below:

$$i \sim F(\mu, \sigma^2), \text{where } \operatorname{cov}(r, \mu) > 0, \operatorname{cov}(r, \sigma^2) > 0$$

$$\max U \left\{ Q \times \max[emax(i_1), emax(i_2), \dots, emax(i_n)] - w\frac{n}{k} \right\}$$

i is the interest rate, with a distribution where both mean μ and variance σ^2 are positively correlated with risk tolerance r. n is the round of the search, $emax(i_n)$ is the expected maximum interest rate one could get in round n. Q is the amount of money the individual invests, and the total benefit the individual can get from n'th search is the amount of money Q times the maximum interest rate found from all n rounds, k is the efficiency of the search, and $1/k$ is the time the individual would cost for each round of search. w is the monetary opportunity cost for every time of search (unit wage). The total cost of search is the total time used for search n/k times unit cost of search w. The individual's goal is to maximize expected utility U, including initial wealth and overall net benefit of search, subtracting total cost from total benefit of search.

Risk Tolerance. Since risk tolerance is positively related to the mean and variance of distribution of returns, lower risk tolerance may be associated with a lower rate of return for each round of search, as well as the lower variance, which determines the uncertainty of results of searching. Less risk tolerant individuals might search less, given the lower expected benefit based on the type of preferred investments. Risk tolerance could also affect the monetary amount of investment Q: the lower the risk tolerance, the smaller amount of money the individual should be willing to input. Therefore, the marginal benefit of search will decrease, with no change of the marginal cost; the optimal amount of search for investment will decrease. On the other hand, in terms of the utility function, less risk tolerant individuals may accept larger losses of expected value to lower the risk level of investments, and thus search more. Combining the two effects, the association between risk tolerance and searching behavior is ambiguous.

METHODS

We used the 2016 Survey of Consumer Finances (SCF) dataset. Chang and Hanna (1992) used a dichotomous measure of information obtained for credit searches, with the 1983 SCF, as the measure of search behavior and analyzed the effects of household characteristics on search. That variable has not been available in the SCF since 1986, however, in 2016, there is a variable that directly asks search behavior for investments. this question lets respondents choose degrees of searching when making searching for investments, from 0 to 10. For the risk tolerance variable, we

use both the old measure (X3014), which has four categories, from no risk tolerance to substantial risk tolerance, and the 11-level new risk tolerance variable introduced in the 2016 SCF (X7557).

Regressions on investment search are shown in Table 1, with two models using the old SCF risk tolerance measure, and two models using the new SCF risk tolerance measure. Other explanatory variables include a number of household characteristics and preference and knowledge variables. Household characteristic variables in Models (ii) and (iii) include age, racial/ethnic status of the respondent, education years of the respondent, health status of the respondent, household income, number of children under 18, whether the household reported using a financial planner for saving. For couples, the dummy variables for the employment status of the household are coded as: employee means either is an employee and neither is self-employed; self-employed means either one is self-employed, regardless of status of the other; retired means one or both are retired and neither is an employee or self-employed; and not working means both are not working and neither is 65 or older. We also included combined variables for gender and marital status: single male, single female, and couple with a female respondent, with the reference category being couple with a male respondent... In order to control for the complexity of the household's financial situation, as a proxy for complexity, we included an additional variable we created as a proxy for complexity, calculated as the number of the overall questions the respondent answers.

This study uses Ordinary Least Squares (OLS) regression as the estimation strategy. Each Primary Economic Unit (for convenience, referred to as a household) has five implicates of data, including imputed values for some variables. For each variable, SCF also includes a "shadow" variable to show the imputation status. Following suggestions in Hanna, Kim, and Lindamood (2018), we excluded households with imputed values (J variable over 99) for searching behavior and risk tolerance, and overall we included 6,194 households in the analyses. The repeated-imputation inference (RII) technique was used in the analysis (Montalto and Sung 1996; Hanna et al., 2018).

RESULTS

In all four models in the table, risk tolerance is related to search intensity. As shown in Table 1, for investment search, there are monotonic positive relationships between the old risk tolerance levels and investment search both without controlling for other characteristics, Regression (i) and with controlling for other characteristics, Regression (ii). Table 1 also shows that there are monotonic positive relationships between the new risk tolerance variable and investment search, as for both Regression (iii) and Regression (iv), the quadratic term for risk tolerance is not significant. (The calculated extreme points for the combined effect of the linear and quadratic terms are 159 for Regression (iii) and 13.5 for Regression (iv), so within the actual range of the new risk tolerance variable, investment search always increases with risk tolerance.)

[Insert Table 1]

The effects of the new risk tolerance variable on investment search (Table 1) is positive. Based on normative economic models, risk tolerance (the inverse of risk aversion) may have multiple channels to associate with investment search behavior. One channel is through influencing mean and variance of interest of potential investments, another is by influencing the type of investment and then the amount of investment. In addition, higher risk tolerance may also lead to greater tolerance of uncertainty search outcomes, and less search. The results from OLS regression for investment

supports the first two channels, that the more risk tolerant individuals will face higher mean and larger variance, as well as be more willing to put the money into investment, which lead to more marginal benefit of searching for investments. Therefore, we expect to see risk tolerant individual will search more on average, which is consistent with the regression result.

For investment search, the interaction term is insignificant but negative. This result shows that holding the asset level constant, more risk tolerant individuals may choose to search less, although not that significant. This result is consistent with one of the hypothesized channels for risk tolerance to affect search behavior, that holding the mean and variance of the interest rate constant, as well as the amount of assets, more risk tolerant individuals would be less interested in search since they can tolerate the risk of lower returns from searching.

SUMMARY AND CONCLUSIONS

We investigated the effects of risk tolerance and other household characteristics on investment searching behavior. We proposed a theoretical framework for the possible mechanisms for relationships between risk tolerance and investment search. Based on our multivariate analyses of the 2016 SCF, we found that risk tolerances have effects on financial search, even when other household characteristics are controlled for investment search. These results also support our hypothesized channels of risk tolerance on searching, that the risk tolerance would be related with the amount of asset, as well as with the type of asset. Based on the effects of interaction terms between risk tolerance and amount of assets, we also find the evidence for our proposed third channel from our theoretical framework between risk tolerance and search effort, that risk tolerance is also related with the tolerated value loss.

For the other explanatory variables, we find that financial knowledge, education, amount of asset, and use of a financial planner have consistent positive effects with investment searching behavior. We also find that couples, those with excellent health, and White respondents, search less than the other categories for each characteristic, and that income and the number of dependent children under 18 are negatively related to search behavior. Generally, age has a negative effect on search.

SELECTED REFERENCES

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TABLE 1.

OLS Regressions – Search for Investments

	(i) Coefficient (s.e.)	(ii) Coefficient (s.e.)	(iii) Coefficient (s.e.)	(iv) Coefficient (s.e.)
Old Risk (=no risk)				
average	1.173***	0.617***		
	(0.090)	(0.098)		
above average	1.719***	0.952***		
	(0.107)	(0.119)		
substantial	2.094***	1.256***		
	(0.181)	(0.183)		
New Risk			0.318***	0.199***
			(0.043)	(0.052)
New Risk Squared/100			-0.089	0.710
			(0.441)	(0.462)
Objective Financial Knowledge				
stock question (=correct)		0.168*		0.154
		(0.085)		(0.084)
compounding question (=correct)		0.087		0.118
		(0.100)		(0.099)
inflation question (=correct)		-0.158		-0.126
		(0.101)		(0.100)
Subjective Financial Knowledge		0.284***		0.256***
		(0.019)		(0.019)
Year of Education of Respondent		0.063***		0.069***
		(0.016)		(0.016)
Age of Respondent/100		0.009		-0.162
		(1.415)		(1.403)
Age Squared/10000		-1.497		-1.478
		(1.338)		(1.328)
Marital Status × Sex (=couple, male respondent)				
single male		-0.362**		-0.403**
		(0.138)		(0.137)
couple, female respondent		-0.114		-0.071
		(0.101)		(0.101)
single female		-0.297*		-0.220
		(0.126)		(0.125)
Health Status of Respondent (=excellent)				
good		-0.118		-0.093
		(0.196)		(0.194)
fair		-0.020		-0.009
		(0.188)		(0.186)
poor		0.096		0.080
		(0.197)		(0.195)
Racial/Ethnic Status of Respondent (=white)				
Black		0.747***		0.622***
		(0.118)		(0.117)
Hispanic		0.481***		0.374**
		(0.136)		(0.135)
Asian/other		0.685***		0.603***
		(0.173)		(0.171)
Log Income		-0.017		-0.014
		(0.020)		(0.020)

Note: *<.05, **<.01, ***<.001. Unweighted results with RII technique. Imputed cases of risk and searching variables were excluded.

TABLE 1.

OLS Result – Search for investments (continued)

	(i) Coefficient (s.e.)	(ii) Coefficient (s.e.)	(iii) Coefficient (s.e.)	(iv) Coefficient (s.e.)
Log Asset		0.070***		0.089***
		(0.015)		(0.021)
New Risk × Log Asset				-0.005
				(0.003)
Household's Job Status (=employed)				
self-employed		0.112		0.012
		(0.101)		(0.102)
retired		-0.031		-0.018
		(0.131)		(0.130)
not working		0.098		-0.006
		(0.218)		(0.216)
Number of Children <18		-0.061		-0.069
		(0.042)		(0.042)
Use Financial Planner for Saving		0.574***		0.585***
		(0.084)		(0.083)
Number of Questions Answered/100		-0.112		-0.111
		(0.063)		(0.062)
Intercept	5.278***	2.710***	4.740***	2.305***
	(0.066)	(0.487)	(0.095)	(0.529)
Obs.	6194	6194	6194	6194
Adj. R^2	0.0532	0.1275	0.0771	0.1414

Note: *<.05, **<.01, ***<.001. Unweighted results with RII technique. Imputed cases of risk and searching variables were excluded.