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The role of information searches in investment choice variation: Digital information, advice seeking and heuristics

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Purchasing risky investments can be a means to maximize individual wealth; but when faced with uncertainty about the investment outcome, individuals search for information on risk-reducing strategies. Most studies focus on digital information and advice-seeking information. This study extends the investigation of information search to discuss heuristics reliance, a simplified information search method. We also examine the effect of risk aversion on our extended information search model. The findings show that, individuals with more risk aversion tend to seek more information. More advice-seeking information search and heuristics reliance through a mass of digital information can increase investor's interest in mutual fund investments. The results demonstrate the value of enhancing the sophistication and accuracy of the information that a counselor provides, especially for investors who are risk averse. This study also has an implication for ethical issues.

Key words: Risk aversion, information search, digital information, advice-seeking information, heuristics.

INTRODUCTION

Purchasing highly risky investments is a means to maximize individual wealth. When faced with uncertainty about the outcomes and sensing a high perception of risk, an individual may assess economic loss, in turn develop risk-reducing strategies (such as searching and acquiring information) to reduce the uncertainty (Taylor, 1974; Lee and Cho, 2005; Howcroft et al., 2003; Fisher and Statman, 1997), and then make an informed decision. Individual information acquisition usually comes from digital and advice-seeking information searches (Loibl and Hira, 2009; Jonas and Frey, 2003; Baker and Nofsinger, 2002). Recent advances in the technology of information searching from Internet services makes it easier to acquire additional digital information, resulting in

an information explosion (Shenk, 1997; Johnson, 2001; Lee and Cho, 2005). The fact that, investors suffer from information overload leads them to want to simplify information processing by means including relying on advisors (Lee and Cho, 2005; Peress, 2004).

To simplify the investment decision processes, people may also employ heuristics to reduce the associated effort with information processing (Simon, 1990) since heuristics can select information according to an effort-reduction framework (Shah and Oppenheimer, 2008). These heuristics are generally useful, although a reliance on the heuristics from an intuitive judgment based on psychological factors may lead to serious errors (Tversky and Kahneman, 1974). However, there has been little empirical research on the effects of heuristics in investment decision-making. This study extends the information search aspects to discuss heuristics reliance, a simplified information research method, on risky investment choices. Under uncertainty, risk aversion is a

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major psychological determinant in individual investment decision-making (Tversky and Kahneman, 1981; Shefrin and Statman, 1985; Pennings and Smidts, 2000; Sitkin and Weingart, 1995). Risk-averse individuals tend to overestimate the likelihood of loss (Sitkin and Weingart, 1995). This tendency influences risky investment choices (Howcroft et al., 2003; Shum and Faig, 2006) and information searches (Cho and Lee, 2006; Money and Crotts, 2003; Taylor and Dunnette, 1974; Welsch and Young, 1982; Yeoh, 2000). This study thus, also examines the effect of risk aversion on our extended information search model.

This study in particular discusses two forms of risky investments based on control-orientation by investors (Warren et al., 1990), directly-controlled investment (e.g. stocks) and indirectly-controlled investment (e.g. mutual funds), or "direct investment" and "indirect investment" for short, respectively. Two main research questions are proposed: One, does extended information search play a crucial role in individual risk-taking in investment choice variation? Two, how does risk aversion influence extended information search and investor risk investment choices? We thus, expect to better understand the effect of information search in investment choice variation.

LITERATURE REVIEW

Information search

Information plays a critical role in the model of risk-taking in consumer behavior formulated by Taylor (1974), which includes three principal stages through which individuals proceed for decision-making under uncertainty. The first stage concerns individual psychological factors. The second stage features the development of risk-reducing strategies, where individuals assess possible social/ economic loss and highlight the information acquisition and handling. The last stage indicates the decision to buy. As a risk-reducing strategy under uncertainty, information search has received extensive study (Lee and Cho, 2005; Peress, 2004; Taylor and Dunnette, 1974; Yeoh, 2000). Most of these studies focus on digital information and advice-seeking information.

Digital information is valuable. Previous studies on individual financial investment decision examine the determinants influencing individual investor behavior, based on economic perspectives. These crucial determinants, representing the criteria of classic wealth-maximization and corporate accounting information (Nagy and Obenberger, 1994), include expected dividends (Baker and Haslem, 1974; Clark-Murphy and Soutar, 2004; Nagy and Obenberger, 1994; Potter, 1971; long-term growth (Potter, 1971), financial stability (Baker and Haslem, 1974; Clark-Murphy and Soutar, 2004), and future expectations (Baker and Haslem, 1974; Nagy and Obenberger, 1994). These economical determinants,

called digital information in this study, are the primary consideration in individual risky investment decisions, alone and in combination with various other variables related investment decision (Nagy and Obenberger, 1994). They also remain valuable criterion when investors seem more concerned about human skill in financial management (Clark-Murphy and Soutar, 2004). Advice-seeking information search is especially necessary since investors now have a greater choice of investment products due to the diversification of financial investments (Warren et al., 1990).

This greater choice leads individuals to make their investment decisions in a context of increasing complexity and uncertainty (Clark-Murphy and Soutar, 2004) due to their lack of understanding for various risky investments (Fisher and Statman, 1997; Howcorft et al., 2003). This leads investors to seek advice and education from professional advisors (Fisher and Statman, 1997), especially face-to-face contact when choosing more complex or riskier investments (Howcorft et al., 2003). Studies on financial investment demonstrate the positive association between information search from advice and risky investments (Howcorft et al., 2003; Peress, 2004; Shum and Faig, 2006). For example, Peress (2004) suggests that, costly but precise information obtained personally from experts might induce investors to hold more stocks.

Heuristics

Heuristics are methods people use to reduce the effort associated with a task (Simon, 1990; Shah and Oppenheimer, 2008). Limited to bounded rationality (Simon, 1955, 1990), people employ heuristics as "methods for arriving at satisfactory solutions with modest amounts of computation" (Simon, 1990, p.11) to reduce the effort they expend on decision-making processes. Shah and Oppenheirmer (2008) summarize heuristics as "methods that use principles of effort-reduction and simplification." Heuristics are related to cognitive biases. Heuristics are usually useful for simplifying information processes (Shah and Oppenheimer, 2008; Baker and Nofsinger, 2002; Tversky and Kahneman, 1974), although reliance on the heuristics from intuitive judgment under uncertainty may lead to severe errors (Tversky and Kahneman, 1974). Shefrin (2000) notes that, investors intend to purchase stocks with desirable qualities, such as good companies having high sales growth and generating strong earnings (Baker and Nofsinger, 2002) but people who intuitively employ such predictions tend to ignore considerations of predictability (Tversky and Kahneman, 1974).

The fact that investors can confuse good companies with good investments may lead to representativeness bias (Baker and Nofsinger, 2002; Shefrin, 2000), a type of cognitive bias (Tversky and Kahneman, 1974). Some

studies show clearly, the importance of using heuristics in decision-making, such as the use of heuristics to improve rapid learning and adaptivity in dynamic environments (Krabuanrat and Phelps, 1998), the adoption of simple "savings heuristics" in retirement saving plans (Benartzi and Thaler, 2007), and a possible use of heuristics in the choices of mutual funds (Hedesstrom et al., 2007). Kozup et al. (2008) empirically support the influence of prior fund performance on fund evaluation. They noted that investors "seemed to gravitate toward prior fund performance in a significant way" (p. 53). Thus, this study expects that heuristics, such as considering a company with strong prior performance to be a good investment, may increase investor's interest in risky investments.

Risk aversion

Risk aversion affects personal decisions under uncertainty (Shefrin and Statmam, 1985; Sitkin and Weingart, 1995; Weber et al., 2002). In behavioral finance, Kahneman and Tversky (1979) assume that an individual is irrational and has inconsistent risk tendencies under risky choices. They argue that, an individual tends to be "risk-averse in choices involving sure gains and to be risk-seeking in choices involving sure losses" (Kahneman and Tversky, 1979: p. 263). Similarly, studies from other perspectives, tend to consider that an individual's tendency to risk aversion or risk seeking is not consistent across situations due to specific factors (Sitkin and Weingart, 1995) such as content domains (Weber et al., 2002).

Other studies widely investigate the effect of risk aversion on an individual's risky decision-making behavior (Fisher and Statman, 1997; Howcroft et al., 2003; Shum and Faig, 2006). For example, Sitkin and Weingart (1995) find empirical support for "the value of retaining the risk propensity construct in theories and empirical research" (p. 1587). They find that risk-averse decision-makers tend to overrate the likelihood of loss relative to the likelihood of gain, and thus avoid making riskier choices. Shum and Faig (2006) demonstrated that, the effect of risk aversion on stock holding is negative and highly significant, being consistently significant across time. Pennings and Smidts (2000) concluded that, more risk-averse individuals "express stronger intentions to reduce the fluctuations in net income" (p. 1344). Thus, they are less likely to purchase riskier investments and are even more willing to pay for professional advisors' advice when decisions involve a high degree of uncertainty and importance (Howcroft et al., 2003; Lee and Cho, 2005).

Risk aversion also affects information searches. Under uncertainty, risk-averse individuals tend to "weight potentially negative outcome more than positive outcome" (Sitkin and Weingant, 1995, p.1577), thus overestimating the likelihood of loss. In Cho and Lee's (2006) model of

risk and risk-reducing strategies, they construct the negative effect of risk propensity on information searches, including the amount of information search and the likelihood of seeking advice from experts. Empirical studies find that, the propensity for risk-taking has a significant negative association with the amount of information (Taylor and Dunnette, 1974; Yeoh, 2000). More risk-averse individuals favor seeking help from professional information (Money and Crotts, 2003; Welsch and Young, 1982).

RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

Applying Taylor's (1974) risk-taking theory, in this paper, risk aversion is referred to as individual psychological factor, information searches is referred to as the development of risk-reducing strategies. Accordingly, this study extends the information searches aspects to discuss heuristics reliance in investor risk-taking. We also examine the value of risk aversion in our empirical research. The research model proposed is shown in Figure 1. We formulate our research hypotheses as follows. Shah and Oppenheimer (2008) review the literature on heuristics, in psychological and economic experiments to propose an effort-reduction framework for understanding heuristics. According to this new framework, they concluded that decision makers expend less effort by "reducing the complexity of the information used during the decision process" (Simon, 1990; Shah and Oppenheimer, 2008, p. 210), such as easy-to-access information used from a representativeness heuristic. Accordingly, we extend the information search aspects to discuss heuristics reliance.

In Taylor's (1974) consumer risk-taking model, individuals acquire information under uncertainty to reduce risk and then decide to buy. Peress (2004) formulates that, costly information acquisition, such as expert advice, induces investors to hold more stocks. Shah and Oppenheimer (2008) posit that, heuristics makes the decision process easier. Accordingly, we propose that more information search increases individual interest in risky investment.

H_{1a}: The more the investor's digital information search, the higher the degree of his/her preference for direct risky investments.

H_{1b}: The more the investor's digital information search, the higher the degree of his/her preference for indirect risky investments.

H_{2a}: The more the investor's advice-seeking information search, the higher the degree of his/her preference for direct risky investments.

H_{2b}: The more the investor's advice-seeking information search, the higher the degree of his/her preference for
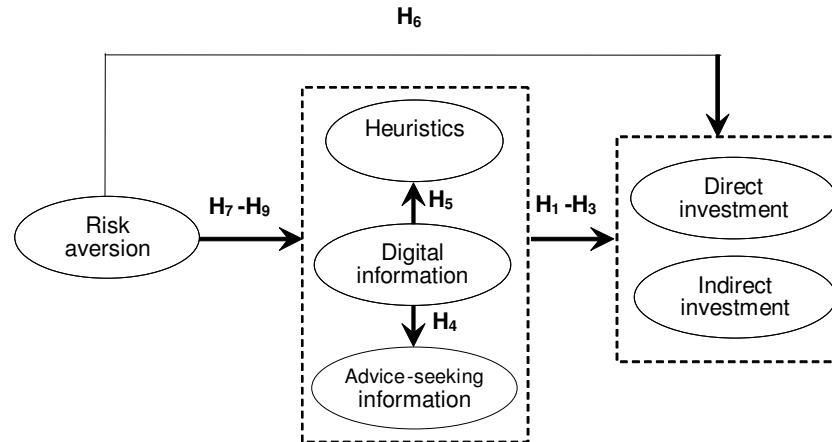
Figure 1. Research model.

indirect risky investments.

H_{3a}: The more the investor uses heuristics, the higher the degree of his/her preference for direct risky investments.

H_{3b}: The more the investor uses heuristics, the higher the degree of his/her preference for indirect risky investments.

Moreover, based on Shah and Oppenheimer's (2008) effort-reduction framework, people use effort-reducing and simplified methods, for example heuristics (Shah and Oppenheimer, 2008; Simon, 1990) and expertise from experts (Ratneshwzr and Chaiken, 1991), to reduce the complexity of information used. Accordingly, we also propose hypotheses that, due to overloaded digital information (Lee and Cho, 2005; Peress, 2004), more digital information search increases both advice-seeking information search and the use of heuristics.

H_4: More digital information searches increase advice-seeking information searches.

H_5: More digital information searches increase the use of heuristics.

Risk aversion has received extensive investigation because of its crucial role in decision-making under uncertainty. Some studies note irrational risk propensity or inconsistent risk aversion across different situations (Kahneman and Tversky, 1979; Weber et al., 2002). Furthermore, risk-averse individuals tend to overestimate the likelihood of loss (Sitkin and Weingart, 1995), which leads to an even stronger desire to avoid risk. This tendency is the main factor in the impact of risk-aversion on risk-taking processes, such as in, decreasing the interest to purchase risky investments (Howcroft et al., 2003; Shum and Faig, 2006) or increasing efforts for information search (Taylor and Dunnette, 1974; Yeoh,

2000).

H_{6a}: The lower the investor's risk aversion, the higher the degree of his/her preference for direct risky investments.

H_{6b}: The lower the investor's risk aversion, the higher the degree of his/her preference for indirect risky investments.

H_7: More risk-averse individuals tend to have more digital information searches.

H_8: More risk-averse individuals tend to have more advice-seeking information searches.

H_9: More risk-averse individuals tend to have more the use of heuristics.

RESEARCH METHODS

Instrument development

To evaluate investor opinions, attitude and behavioral intention in risky investment decision-making, the survey instrument measurement was a psychometric scale developed from the literature as follows. For the purposes of this study, 'risk aversion' was defined as an investor's current tendency, to avoid risks in the gain domain, based on prospect theory (Kahneman and Tversky, 1979), and was measured with three items that reflect the tendency to realize economic gain. The measures of 'risk aversion' for individuals were adapted from the scenarios in Kahneman and Tverskey (1979) and in Shefrin and Statman (1985). Following Shah and Oppengeimer (2008) and Tversky and Kahneman (1974), the concept of 'heuristics' in this article refers to the simplification of information searches based on intuitive judgment. Heuristics was measured with three items adapted from Shefrin (2000) and Baker and Nofsinger (2002), based on the concepts of Tversky and Kahneman's (1974) representiveness heuristics. These items measured the investor's judgment of good investment, based on information from companies with high sales growth, generating strong earnings, and prior strong performance.

The construct of 'digital information search' was assessed by three items, following Nagy and Obengerger (1994) and adapted from Lee and Cho (2005). These items measured the investor's tendency to make information searches to evaluate a firm's expected earnings, financial statements, and the status of its products/services. Items for the construct of 'advice-seeking information search' were combined from Lee and Cho (2005) and Nagy and Obengerger (1994). These items measured the investor's tendency to seek help from professional financial advisors, family, friends, and published materials (e.g. magazines and brochures from financial institutions) (Lee and Cho, 2005, p. 118). 'Preference for risky investment' according to the control orientation, this was measured by four items, adapted from Warren et al. (1990) and from Fisher and Statman (1997), in order to reflect the tendency of investor's preference for different risky investments. The items of directly-controlled risky investments included stocks, futures, and options. The items of indirectly-controlled risky investments included domestic and foreign mutual funds (Warren et al., 1990; Peress, 2004). Detailed measurement items for 6 constructs are shown in Appendix A. The sources that we used are also presented in Appendix A. All items were measured on a 5-point Likert scale (1= strongly disagree, 3= neither agree nor disagree, and 5= strongly agree). The preliminary instrument was reviewed by four financial scholars and two investment scholars to assess its clarity. The instrument items were pretested with 55 investors using the same data collection method. Of the 55 questionnaires, seven were discarded due to the respondents' inexperience with investment. The Cronbach's α of scales was acceptable (Nunnally and Bernstein, 1994) with the minimum score being 'direct investment preference' at 0.729 and the maximum being 'digital information search' at 0.831.

Data collection and description

Data was collected using a questionnaire survey administered through an interview. The survey was conducted in 5 security companies and 5 banks in Taipei, Taiwan by 8 trained interviewers who are EMBA students. The chosen subjects were currently holding stocks or had experience purchasing risky investments including mutual funds, futures/options, and real estate. The reason for selecting individuals with some investment experience was that, based on the feedback from the pilot study, they were more likely to understand and complete the questionnaire correctly and they seemed to be more interested in participating.

The subjects were informed that their anonymity was guaranteed. In an effort to motivate subjects to respond, an incentive in the form of a US$10 supermarket coupon was offered to all participants. This survey collected 395 responses. A total of 378 successful questionnaires were obtained (effective response rate: 95.7%). Of the respondents, 65.3% were females; 59.8% were in the 26 to 40 year old group and 28.6% were more than 40 years old; 53.1% were married; 76.8% had at least a university degree; and 52.6% had annual incomes of US $20,000 or more.

DATA ANALYSES AND RESULTS

Developing measurement models with CFA

Testing for the existence of common method variance was conducted because the data was self-reported. According to Harman's one-factor test (Podsakoff and Organ, 1986), exploratory factor analysis was performed, and the results showed the presence of 6 distinct factors with eigenvalue greater than 1.0, rather than a single factor. Moreover, these 6 factors together accounted for 74.16% of the total variance, and the largest factor did not account for a majority of the variance (14.33%). These results did not indicate a single-factor structure that explained the majority of covariance (Devaraj et al., 2002). Hence, common method variance was not of particular concern in this study.

Data analysis was performed according to a two-stage methodology (Anderson and Gerbing, 1988), in which the development of measurement model is the first stage and evaluation of a structural model is the second stage. LISREL 8.5 was used for data analysis with CFA (confirmatory factor analysis) as the initial stage and path analysis as the latter stage. Using CFA, the measurement model was revised by dropping items that shared a high degree of residual variance with other items (Gefen et al., 2000; Gerbing and Anderson, 1988). There was no item dropped at this stage. The CFA showed acceptable fit indices (Gefen et al., 2000; Hatcher, 2006) with the chi-square/df ratio for this model being 1.86 (since 165.38/89=1.86), NNFI=0.95, CFI=0.96, GFI=0.95, AGFI=0.92, RMR=0.034, and RMSEA=0.048.

Convergent validity

Convergent validity of the measurement model was assessed by three criteria. First, a significant t-statistic for all factor loadings on their assigned construct should be obtained (Anderson and Gerbing, 1988). Second, the composite reliabilities (CR) for each construct must be at or above 0.7 (Fornell and Larcker, 1981) and third, the average variance extracted (AVE) for each construct should exceed 50% (Fornell and Larcker, 1981). As shown in Table 1, all factor loadings were statistically significant; CR for each construct was greater than 0.7, with the values ranging from 0.75 to 0.84, and AVE for each construct was greater than 0.5, with values from 0.51 to 0.66. Thus, convergent validity is demonstrated.

Discriminant validity

The chi-square difference test (Anderson and Gerbing, 1988) was used to assess discriminant validity. We computed the χ^2 difference for the original measurement model with its 6 latent constructs against the 15 other possible alternative measurement models with 5 latent constructs, where the expected correlation between the two constructs of interest was fixed at 1. The results that all χ^2 difference statistics were clearly significant indicates that, the original measurement model was significantly better than all other possible alternative measurement models. Thus, this test supported the discriminant validity.

Testing of the structural model

First, goodness of fit indices for the structural model was checked. As shown in Figure 2, the structural model

Table 1. Results of reliability and convergent validity testing.

Items Standardized loading	t-value*	Mean	Reliability (C.R.)	AVE
Risk aversion				
RAV1 0.87	18.21			
RAV2 0.93	19.60	3.58	0.80	0.60
RAV3 0.42	8.15			
Heuristics				
HEU1 0.71	13.43			
HEU2 0.80	15.26	3.34	0.75	0.51
HEU3 0.61	11.51			
Digital information search				
DIG1 0.74	15.57			
DIG2 0.83	17.84	3.79	0.84	0.64
DIG3 0.82	17.47			
Advice-seeking information search				
ADV1 0.76	15.40			
ADV2 0.82	16.78	3.30	0.80	0.58
ADV3 0.70	14.08			
Direct Investment				
DIR1 0.68	7.28	3.28	0.75	0.60
DIR2 0.86	7.74			
Indirect Investment				
IND1 0.91	10.89	3.70	0.79	0.66
IND2 0.70	9.66			

Note: * t-statistics greater than 3.317 are significant at $p < 0.001$, C.R: composite reliability, AVE: average variance extracted.

presented acceptable fit indices, with the chi-square/df ratio being 1.937 (since 176.301/91 = 1.937), NNFI=0.95, CFI=0.96, GFI=0.94, AGFI=0.92, RMR=0.039 and RMSEA=0.050. Second, the standardized LISREL path coefficients were examined, as shown in Table 2 and Figure 2, including the path coefficients and overall fit indices, with the following results.

Path analysis

In terms of information search aspects, 'heuristics' were found to have significantly positive effect on both 'direct and indirect investment preference', supporting H3a and H_{3b} ($\beta = 0.13$, p<0. 1 and $\beta = 0.23$, p<0.01). 'Advice-seeking information search' was found to have significantly positive effect on 'indirect investment preference', supporting H_{2b} ($\beta = 0.19$, p<0.01), but it did not have this effect on 'direct investment preference', not supporting H_{2a} ($\beta = -0.05$, n.s.). 'Digital information search' was not significantly related to either direct or indirect

investment preference, not supporting H_{1a} and H_{1b} ($\beta = -0.06$, 0.04, n.s.). In addition, 'digital information search' was found to have significantly positive effect on 'advice-seeking information search', supporting H_4 ($\beta = 0.20$, p<0.01), and on 'heuristics', supporting H_5 ($\beta = 0.25$ p<0.001).

'Risk aversion' was found to have significantly negative effect on 'direct investment preference', supporting H6a ($\beta = -0.23$, p<0.001), but it did not have the same effect on indirect investment preference, not supporting H_{6b} ($\beta = 0.02$, n.s.). Moreover, as expected, risk aversion was a strong significant positive predictor of information search involving digital information, advice-seeking information search, and heuristics ($\beta = 0.21$, p<0.001, $\beta = 0.13$, p <0.05, and $\beta = 0.32$, p <0.001 respectively), supporting H_7, H_8 and H_9. Moreover, the direct effect of investors' risk aversion on their mutual fund preference was small (direct effect = 0.02), but the indirect effect was larger (indirect effect = 0.13) and significant (p < 0.001). This significant indirect effect was primarily from information searches.
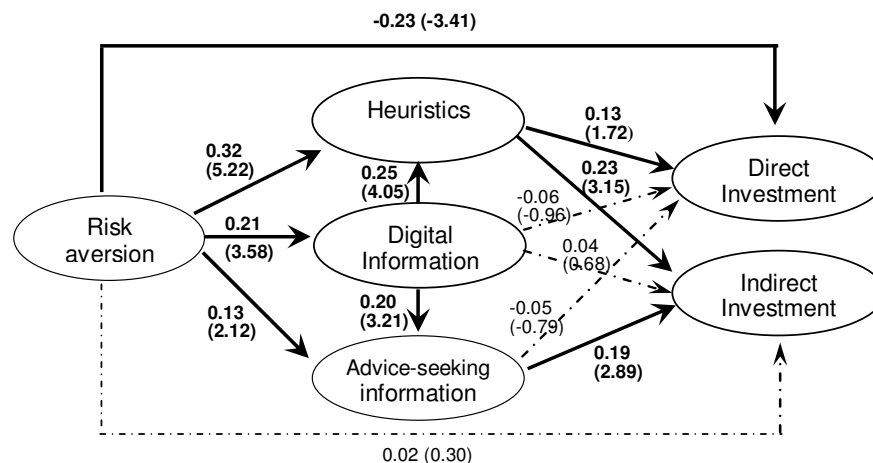
Figure 2. Path analysis. Note: The dotted lines indicate non-significant relationships between constructs; the solid lines indicate that significant relationships between constructs; Values in parentheses are t-statistics, t-statistics greater than 1.65 are significant at p < 0.1, 1.97 for p<0.05, 2.59 for p<0.01, and 3.32 for p<0.001. Overall fit indices (n = 378): chi-square/df = 1.937, NNFI=0.95, CFI=0.96, GFI=0.94, AGFI=0.92, RMR=0.039 and RMSEA=0.050.

Summary

In direct risky investment decision-making, the findings suggest risk aversion is a stronger determinant than information search aspects. In indirect risky investment decision-making, information search is a successful risk-reducing strategy, where heuristics have the largest and significantly positive effects on individual investment preference.

DISCUSSION

This article examines two questions: 1) Does extended information search play a crucial role in individual risk-taking in investment choice variation? 2) How does risk aversion influence extended information search and investor risk investment choices? This paper addresses these questions by dividing risky investments into the two dimensions of direct and indirect investment, and by extending information search to discuss heuristics reliance. We successfully confirm our proposed model and address the following discussion and implications.

Importance of information search

One contribution lies in empirically identifying the effect of heuristics on risky investment preferences, thereby expanding the understanding of information searches. Our results suggest that, information search is a powerful determinant in risk-taking for risky investment choice variation. We find significant support for the effect of heuristics, though limited support for the effect of both digital and advice-seeking information. Heuristics have the strongest positive influence on both stocks/options and mutual fund investment choices, especially for the latter. This result echoes Kozup et al.'s (2008) demonstration of a significant influence of prior fund performance on fund evaluation. As Krabuanrat and Phelps (1998) suggest, the use of heuristics improves rapid learning and adaptivity in dynamic investment environments. Possibly, by learning from their investment experience (Shah and Oppenheimer 2008), investors find that the accuracy of heuristics may help them to achieve expected returns (Peress, 2004) in a simple way. This simple way provides a piece of information that is readily available and easily understood (Kahneman and Frederick, 2002; Gigerener et al., 1999) to evaluate a complex investment task. Accordingly, the use of heuristics may induce investors to have more interest in risky investments.

Our results show that, advice-seeking information searches have a strong positive influence on mutual fund investment choices, especially from expert advice (due to the biggest standardized loading in construct of advice-seeking information search, 0.82, as shown in Table 1). This result is in agreement with Peress (2004) that information from advice-seeking may be costly but accurate. The costly and accurate information generates expected or even more return for investors in mutual fund investments, thereby increasing their mutual funds preference. Digital information searching is one of the most often considered in individual investment decision-making (due to the highest mean in the information searches aspect, 3.79, as shown in Table 1) but digital information search has little effect on risky investment intentions.

Table 2. Hypothesis results for the structural model.

Research hypothesis	Path coefficient	t-value
H$_{1a}$: Digital information search → direct investment	- 0.06	-0.96
H$_{1b}$: Digital information search → indirect investment	0.04	0.68
H$_{2a}$: Advice-seeking information search → direct investment	-0.05	-0.79
H$_{2b}$: Advice-seeking information search → indirect investment	0.19 **	2.89
H$_{3a}$: Heuristics → direct investment	0.13 +	1.72
H$_{3b}$: Heuristics → indirect investment	0.23 **	3.15
H$_4$: Digital information search → advice-seeking information search	0.20 **	3.21
H$_5$: Digital information search → heuristics	0.25 ***	4.05
H$_{6a}$: Risk aversion → direct investment	- 0.23 ***	-3.41
H$_{6b}$: Risk aversion → indirect investment	0.02	0.30
H$_7$: Risk aversion → digital informaiton search	0.21 ***	3.58
H$_8$: Risk averiosn → advice-seeking information search	0.13 *	2.12
H$_9$: Risk aversion → heuristics	0.32 ***	5.22

+ $p < 0.1$, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

This finding does not match the original assumptions of H$_{3a}$ and H$_{3b}$. A possible reason is the problem of information asymmetry from insufficient corporate disclosure. "Corporate disclosure provides investors with a common pool of knowledge" (Yoon et al., 2010), such as statements, management discussion, and forecasts, for investment decisions. Although investors are more likely to search for more digital information, they might worry about the problem of information asymmetry due to insufficient corporate disclosure (Yoon et al., 2010). This concern may limit the effect of digital information search on risky investment intention, and may induce investors to seek more help from experts to reduce information asymmetry.

More digital information search increases advice-seeking information search, which in turn increases individual interest in mutual funds choices. This result echoes Thaler et al. (1997) and Gifford's (2001) suggestion that, more information is not always better. However, more information may be better when it comes from people knowledgeable in more complex investments, such as mutual funds (Fisher and Stateman, 1997; Howcorft et al., 2003; Lee and Cho, 2005). More digital information search also increases heuristics reliance, which in turn increases individual interest in risky investments. This result provides empirical support for the idea that, individuals are more likely to employ heuristic simplification to decrease the amount and complexity of information (Tversky and Kahneman, 1974; Baker and Nofsinger, 2002; Shah and Oppenheimer, 2008).

Influence of risk aversion

Results suggest that, risk aversion could indeed be a powerful determinant in risk-taking for risky investment choice variation. The findings show the significant direct effect of risk aversion on stocks/options investment choices, but a great indirect effect of risk aversion on mutual fund choices through information search. This finding is another contribution of this paper.

First, risk aversion has a negative and strong association with stocks/options choices. This finding supports risk-aversion's traditional direct effect and is consistent with Sitkin and Weingart (1995), Pennings and Smidts (2000), and Howcroft et al. (2003). Second, individuals with more risk aversion are more likely to increase information searches. This conclusion is consistent with Welsch and Young (1982), and Money and Crotts (2003). More information search, especially from advice-seeking and from heuristics, may decrease individual concern with potential loss (Peress, 2004), and thus increase interest in mutual fund investment.

IMPLICATIONS

Empirical evidence for importance of information search has several implications for financial consultants and government. First, this article demonstrates the value of enhancing the sophistication and accuracy of the information that a counselor provides. According to Peress's (2004) model, in order to induce investors' interest in risky investments, advisors should provide greater value in information to enhance their reputation for accuracy (Yaniv and Kleinberger, 2000; Jonas and Frey, 2003; Peress, 2004). For example, advisors could enrich their information searches (Peress, 2004), raise their organizational qualities and expertise (Budescu and Rantilla, 2000), such as the presentation of summary information (Kozup et al., 2008). This sophistication of information searches, thus reduces the load due to the

digital information explosion from the Internet, obtains investors' trust and helps their economical success. Next, we clarify the significantly positive influence of heuristics on risky investment preferences. Since investors tend to reduce the information search effort in financial decision-making by heuristic simplification, this tendency might lead to severe errors (Tversky and Kahneman, 1974). Advisors could clearly show the likelihood of judgment bias due to a heuristic based on psychological cognitive judgment (Tversky and Kahneman, 1974; Baker and Nofsinger, 2002). More balanced information search, including supporting information and conflicting evidence (Jonas and Frey, 2003), might be a clear exposition.

Third, this study has an implication for ethical issues. Our results show that more advice-seeking information search or reliance of heuristics increase mutual fund investments. Accordingly, the government should promote policies dealing with the ethical behavior of both firms and advisors (Diacon and Hasseldine, 2007) to protect individual investment in mutual funds, especially for investors who are risk averse.

LIMITATIONS AND FUTURE RESEARCH

Some factors related product knowledge and consumer experience have a U-shape relationship with information search (Guo, 2001). This article does not include investors' investment knowledge as a studied variable. Although the respondents in this article have investment experiences, their perceived levels of investment knowledge and understanding might be different. This investors' knowledge/understanding may influence their information searching behaviors and investment choices (Howcroft et al., 2003). These are areas for future research.

For direct risky investment choices (stocks/ options), this result suggests that information search has little effect. Although more precise information might induce investors to hold more stocks (Peress, 2004), precise information is always costly. According to the cost-benefit framework (Stigler, 1961), investors may not have a fair trade-off between the benefits of information searches and their costs for stock investments. Further research could include personal wealth as a moderating factor that might further explain our results.

Conclusion

Most studies on investor searches for information on risk-reducing strategies in risky investment decision-making focus on digital information and advice-seeking information. This study extends the discussion on information search to discuss heuristics reliance, a simplified information search method. Based on the proposed extended information search model, we hypothesize that

the level of risk aversion determines the level of information searches, and both risk aversion and information searches determine investor investment preferences.

Reporting on two dimensions of direct (stocks/options) and indirect (mutual funds) investment, the findings show the significant direct effect of risk aversion on stocks/options investment choices, but a great indirect effect of risk aversion on mutual fund choices through information search. Because risk aversion and information acquisition are important contributing factors under uncertainty, this empirical demonstration of an extending model may have help to better understanding individual risk decision-making behavior.

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Appendix

Appendix A. Detailed measurement items for six constructs.

Constructs		Items	Sources
Direct investment	DIR1	I would like to invest in stocks.	Warren et al. (1990), Fisher and Statman (1997), Peress (2004)
	DIR2	I would like to invest in futures/options.	
Indirect Investment	IND1	I would like to invest in domestic mutual funds.	
	IND2	I would like to invest in foreign mutual funds.	
Risk aversion	RAV1	I would like to realize the gain as soon as the stock increases in price.	Kahneman and Tversky (1979), Shefrin and Statman (1985, pp. 779)
	RAV2	Considering a stock purchased one month ago for $100, it is found that the stock is now selling at $110. After hold the stock for one more period, there are 50-50 odds between gaining an additional $10 or "breaking even." I would like to sell the stock to realize the $10-gains now.	
	RAV3	I would like to realize the (substantial financial) gains from stocks more than to realize the (substantial financial) losses from stocks.	
Heuristics	HEU1	I think that this stock, from a company with high sales growth and generating strong earnings, is likely to be a good investment.	Tversky and Kahneman (1974, p. 1126), Baker and Nofsinger (2002, p.100)
	HEU2	I think that the return on this stock, from a company with high sales growth and generating strong earnings, is likely to be higher.	
	HEU3	I think that the future return on this stock, from a company with strong performance during the past three to five years, is likely to be higher.	
Digital information search	DIG1	I would like to search for information about a firms' expected earnings.	Nagy and Obengerger (1994), Lee and Cho (2005)
	DIG2	I would like to search for informtiaon about firms' financial statements.	
	DIG3	I would like to search for information about firm status in industry.	
Advice-seeking information search	ADV1	I would like to search for information from magazines and brochures from financial institutions to help making financial decisions.	Nagy and Obengerger (1994), Lee and Cho (2005)
	ADV2	I would need advice on investment options from professional financial advisors in making financial decision.	
	ADV3	I would need advice on investment options from family/friends in making financial decision.	