Information Searches Development in Investment Decisions

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Abstract

How do individuals develop information searches under uncertainty? It is a crucial question attracting a number of studies on investment decision-making. Information on financial measures and advice seeking information are two usual studied variables in financial investment decision-making. This study extends the information search aspects to discuss heuristics reliance, a simplified information search method, on individual investment choices. We further examine the moderating effect of income on our extended information search model. 378 investors with investment experiment from financial holding companies were surveyed and the multiple-group structural equation modeling was employed. Reporting on two dimensions of stocks/options and mutual funds investment, the findings show that individuals with more risk aversion tend to seek more information. Heuristics have a strong positive influence on financial investment preferences. A mass of digital information through more advice-seeking information search and heuristics reliance can increase investor interest in mutual fund investments. We clarify income differences in individual information searches in investment decision-making. The findings imply that (1) the movement to teach financial students to recognize investor psychology might be required to be more extensive, and (2) provision of financial information for different income groups may be needed, and meantime investor psychology is suggested to be taken into serious consideration.

Keywords: risk aversion, information search, heuristics, income

1. Introduction

How do individuals develop information searches under uncertainty? It is a crucial question attracting a number of studies on risky decision-making (Cho & Lee, 2006; Fodness & Murray, 1997; Money & Crotts, 2003; Taylor, 1974). "Uncertainty about the outcome can be reduced by acquiring and 'handling' information (Taylor, 1974, p. 54)." According to the risk-taking theory in consumer behavior (Taylor, 1974), individuals may assess economic losses, and in turn develop risk-reducing strategies (such as searching and acquiring information) to reduce the uncertainty (Fisher & Statman, 1997; Howcroft, Hewer, & Hamilton, 2003; Taylor, 1974), and then make an informed decision.

Purchasing financial investments has been a means to create individual wealth, while there is a high uncertainty about investments. Investors seek to achieve expected returns "by decreasing the level of associated uncertainty through information search (Fodness & Murray, 1997)." Research shows the significant effects of information searches on investment decision-making (Peress, 2004; Shum & Faig, 2006). Information on financial measures (Clark-Murphy & Soutar, 2004; Nagy & Obenberger, 1994) and advice seeking information (Baker & Nofsinger, 2002; Lee & Cho, 2005) are two usual studied variables.

Recent advances in the technology of information searching from Internet services makes the acquisition of additional information much easy, resulting in an information explosion (Lee & Cho 2005; Johnson, 2001). The fact that investors suffer from information overload leads them to want to simplify information processing by means, such as relying on advisors (Lee & Cho, 2005; Peress, 2004). 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 & Oppenheimer, 2008). These heuristics, such as viewing a company with a strong prior performance as a good investment (Baker & Nofsinger, 2002; Shefrin, 2000) are generally useful, although a reliance on the heuristics from an intuitive judgment based on psychological factors may lead to severe errors (Tversky & Kahneman, 1974). However, few empirical studies have focused on the

effects of heuristics on investment decision-making. This is a gap that this study endeavors to fill.

Two characteristics factors, risk aversion and income, have been noted to have a considerable impact on information searches (Money & Crotts, 2003; Peress, 2004) and investment decisions (Shefrin & Statman, 1985; March &Shapira, 1987), and will be explored further in this article. First, risk aversion is a crucial individual psychological factor from a traditional risk-taking theory (March & Shapira, 1987). Risk-averse individuals tend to overrate the potential losses (Sitkin & Weingart, 1995) as well as to perceive greater amounts of risk (March & Shapira, 1987). This tendency greatly affects information searches (Cho & Lee, 2006; Money & Crotts, 2003) and financial investment choices (Howcroft et al., 2003; Shum & Faig, 2006), and will allow us to better explain individual development of information searches in investment decisions. Second, research finds that income has prominent direct effects (Donkers & Van Soest, 1999; Shum & Faig, 2006) on information searching behavior and investment choices separately. This article attempts to shed light on how income differences may affect individual development of information searches in investment decisions.

This study in particular discusses two forms of financial investments based on control-orientation by investors (Warren, Stevens and McConkey, 1990), directly-controlled investment (e.g. stocks/options) and indirectly-controlled investment (e.g. mutual funds), or "stocks/options investments" and "mutual fund investments" for short, respectively. Three research questions are proposed: One, how do extended information searches influence individual investment preferences? Two, how does risk aversion influence extended information search and individual investment preferences? Three, what is the moderating effect of income in a proposed extended information search model? This study expects to better understand individual development of information searches in investment decisions.

2. Literature Review and Hypotheses

In this article, we build on the logic of Taylor's (1974) risk-taking theory to present a research model. Risk-taking in consumer behavior, as formulated by Taylor (1974), describes three principal stages that individuals proceed through for decision-making under uncertainty. The first stage concerns individual psychological factors, where perceived risk and social-esteem influence anxiety. The second stage features the development of risk-reducing strategies, where individuals assess social/economic loss and highlight information acquisition and handling. The last stage indicates the decision to buy.

Concerning psychological factors in risky decision-making behavior, some researchers argue that "risk attitudes and risk perceptions play a key role in understanding consumers' risk behavior (Pennings, Wansink, & Meulenberg, 2002, p. 92; Sitkin & Weingart, 1995)," particularly in financial and health-related domains (Pennings & Smidts, 2000; Pennings et al., 2002 ; Cho & Lee, 2006). Empirical studies have shown that the inclusion of risk attitude is necessary in studying consumer risky decision making behavior (Sitkin & Weingart, 1995; Cho & Lee, 2006), since individual risk aversion influences risky choices (Sitkin & Weingart, 1995; Shum & Faig, 2006) as well as information searches development (Money & Crotts, 2003; Cho & Lee, 2006). In this study, we focus on the risk attitude to investigate the effect of risk aversion on information searches development in individual investment decisions.

This article follows the logic of Taylor's (1974) risk-taking theory: individual psychological factors - risk-reducing strategies - decision to buy. In this article, risk aversion is referred to by psychological factors, information searches are referred to the development of risk-reducing strategies. In addition, taking into consideration the substantial effects of risk aversion in investment decisions, the influence of risk aversion on investment preferences will be further explored in this study. Accordingly, this article proposes a research model that risk aversion has a double effect on the preferences for financial investments: a traditional direct effect and an indirect effect via the information searches. Besides, we will further explore the moderating roles of income in this article. Our research model is illustrated in Figure 1. We formulate our research hypotheses from literature as follows.

2.1 Information Search

Moutinho (1987) defines information search as "an expressed need to consult various sources prior to making a purchase decision (Fodenss & Murray, 1997 p. 505)." In Taylor's (1974) theory of risk-taking in consumer behavior, information search plays a risk-reducing strategy before individuals decide to buy, and receives extensive study in financial domain (Lee & Cho, 2005; Peress, 2004; Taylor & Dunnette, 1974; Yeoh, 2000). Most of these studies focus on using information about the financial product, called digital information here, and seeking advice information.

2.1.1 Digital Information

Digital information refers to the information about the financial products, such as firms' expected earnings and financial statements. Digital information is a crucial determinant in individual investment decision-making (Clark-Murphy & Soutar, 2004; Nagy & Obenberger, 1994; Baker & Haslem, 1974). Early studies examine the determinants influencing individual investor behavior, based on economic perspectives. Results find some crucial determinants on corporate accounting information (Nagy & Obenberger, 1994), including expected dividends (Baker & Haslem, 1974; Nagy & Obenberger, 1994; Clark-Murphy & Soutar, 2004), long-term growth (Nagy & Obenberger, 1994), financial stability (Baker & Haslem, 1974; Clark-Murphy & Soutar, 2004), and future expectations (Baker & Haslem, 1974; Nagy & Obenberger, 1994).
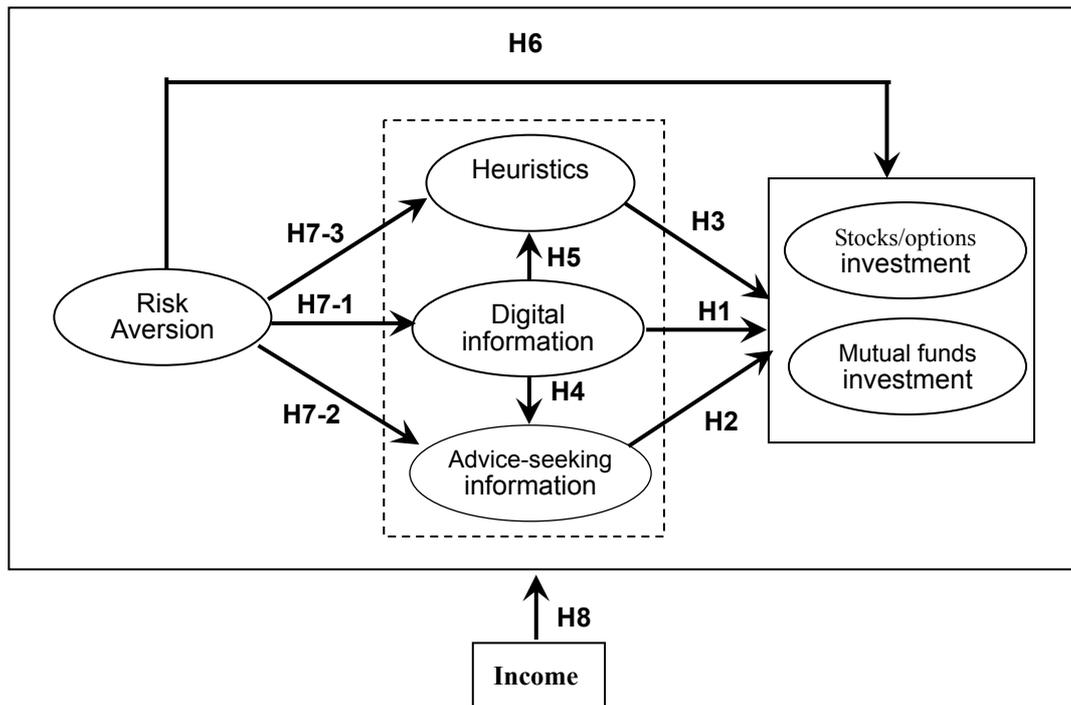

Figure 1. Research model and hypotheses

Studies have demonstrated well the positive association between digital information search and individual investor behavior (Nagy & Obenberger, 1994; Clark-Murphy & Soutar, 2004). They find that digital information search is the primary consideration in individual investment decisions, even combined with various variables such as the personal-financial-need factor and the advocate-recommendation factor (Nagy & Obenberger, 1994). Digital information also remains as a valuable criterion when investors seem more concerned about human skills in financial management (Clark-Murphy & Soutar, 2004). Thus, we expect that digital information search will increase individual interest in financial investments because investors might reduce their uncertainty via great understanding of a company's financial status, based on economic perspectives. Hence we hypothesize:

Hypothesis 1: *An Investor's digital information search positively influences his/her preferences for (a) stocks/options investments or for (b) mutual funds investments.*

2.1.2 Advice-Seeking Information

Seeking advice, such as from professional financial advisors (Baker & Nofsinger 2002; Shum & Faig, 2006), from friends/relatives (Nagy & Obenberger, 1994; Baker & Nofsinger, 2002), and from magazines/brochures published by financial institutions (Lee & Cho, 2005), is especially necessary since investors now have a greater choice of investment products due to the diversification of financial investments (Warren et al., 1990). Moreover, due to the lack of understanding for various investments, investors may seek advice and education from professional advisors (Fisher & Statman, 1997; Howcorft et al., 2003). They especially seek out face-to-face contact when choosing more complex or riskier investments (Howcorft et al., 2003).

Studies on financial investments demonstrate the positive association between advice-seeking information search

and individual investor behavior (Howcorft et al., 2003; Shum & Faig, 2006). For example, Fisher and Statman (1997) suggest that investors look forward to education and advice from professional advisors because forming an investment portfolio is a complex project in terms of mutual fund investment. Howcorft et al., (2003) interview 244 respondents aged over 18 and in socio-income groups A-D. They find that investors prefer the information from professional advisors when investment decisions involved high degrees of uncertainty and importance. They also find that investors especially desired face-to-face contact when choosing more complex and riskier investments. Peress (2004) formulates that costly but precise information obtained personally from experts might induce investors to hold more stocks. Shum and Faig (2006) use data form the U.S. survey of Consumer finances (SCF) in 1992, 1995, 1998, and 2001 to analyze the determinants of stock holdings. Their findings are consistent with Peress's (2004) conclusion and they further find that professional advice positively influences the decision to hold stocks across time. Accordingly, we hypothesize:

Hypothesis 2: *An investor's advice-seeking information search positively influences his/her preferences for (a) stocks/options investments or for (b) mutual funds investments.*

In this article, we extend information searches aspects to discuss heuristics reliance, a simplified information search method, in individual investment choices.

2.2 Heuristics

2.2.1 An Effort-Reduced Information Search Based on Psychological Factors

Heuristics are methods people use to reduce the effort associated with a task (Simon, 1990; Shah & Oppenheimer, 2008). Limited to bounded rationality (Simon, 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 in the decision-making process. Shah and Oppenheimer (2008) review the literature on heuristics in psychological and economic experiments, and propose an effort-reduction framework for understanding heuristics. They summarize heuristics as "methods that use principles of effort-reduction and simplification." Some financial studies on why people employ heuristics have noted that individuals will suffer from both information overload (Lee & Cho, 2005; Peress, 2004) and investment complexity (Fisher & Statman, 1997; Warren et al., 1990) due to bounded rationality (Simon, 1990). Therefore, investors may employ heuristics as a method to reduce the effort they expend on information processes, such as easy-to-access information (Shah & Oppenheimer, 2008) from attribute substitution (Kahneman & Frederick, 2002). Accordingly, we extend the information search aspects to discuss heuristics reliance.

2.2.2 Heuristics and Cognitive Biases

Heuristics are related to cognitive biases. Heuristics are usually useful for simplifying information processes (Shah & Oppenheimer, 2008; Baker & Nofsinger, 2002; Tversky & Kahneman, 1974) and make the decision process easy (Shah & Oppenheimer, 2008). However, reliance on heuristics from intuitive judgment under uncertainty may lead to severe errors (Tversky & Kahneman, 1974). For example, Tversky and Kahneman (1974) state that people tend to employ intuitive predictions in assessing the future value of a company or stock. Shefrin (2000) notes that investors intend to purchase stocks with desirable qualities, such as good companies having high sales growth and strong earnings (Baker & Nofsinger, 2002). Baker and Nofsinger (2002) agree that investors tend to employ shortcuts by using heuristic simplification to decrease the amount and complexity of information. But people who intuitively employ such predictions tend to ignore considerations of predictability (Tversky & Kahneman, 1974). The fact that investors can confuse good companies with good investments may lead to a representativeness bias (Baker & Nofsinger, 2002; Shefrin, 2000), a type of cognitive bias (Tversky & Kahneman, 1974).

2.2.3 Using Heuristics in Decision-making

Some studies show the importance of using heuristics in decision-making, such as using heuristics to improve rapid learning and adaptivity in dynamic environments (Krabuanrat & Phelps, 1998), the adoption of simple "savings heuristics" in retirement saving plans (Benartzi & Thaler, 2007), and a possible use of heuristics in the choices of mutual funds (Hedesstrom, Svedsater, & Garling, 2007). Shah and Oppenheimer (2008) posit that heuristics make the decision process easy (Simon, 1990) by an effort-reduction framework. Kozup et al. (2008) empirically support the influence of prior fund performance on fund evaluation. They note that investors "seem to gravitate toward prior fund performance in a significant way (p. 53)." Thus, we advocate that employing heuristics, such as considering a company with strong prior performance to be a good investment, may increase an investor's interest in financial investments.

Hypothesis 3: *An investor's use of heuristics positively influences his/her preferences for (a) stocks/options*

investments or for (b) mutual funds investments.

Recent advances in the technology of information search make the acquisition of digital information much easy (Johnson, 2001). This increased information may generate information overload for investors. In this light, we expect that investors who are more likely to search digital information understand that more digital information is not always better (Thaler, Tversky, Kahneman, & Schwartz, 1997). Based on Shah and Oppenheimer's (2008) effort-reduction framework, people use effort-reducing and simplified methods, for example heuristics (Shah & Oppenheimer, 2008; Simon, 1990) and leverage expertise from experts (Fisher & Statman, 1997; Lee & Cho, 2005), to reduce the complexity of information used to find the needed information easily. Hence we hypothesize:

Hypothesis 4: An investor's digital information searches positively influences his/her advice-seeking information searches.

Hypothesis 5: An investor's digital information searches positively influences his/her use of heuristics.

2.3 Risk Aversion

Risk aversion refers to an individual's current tendency to avoid risks (Sitkin & Weingart, 1995). Risk aversion affects personal decisions under uncertainty (Shefrin & Statmam, 1985; Sitkin & Weingart, 1995; Weber, Blais, & Betz, 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 & Tversky, 1979: p. 263). Similar studies from other perspectives tend to consider that an individual's tendencies toward risk aversion or risk seeking are inconsistent across situations due to specific factors (Sitkin & Weingart, 1995), such as content domains (Weber et al., 2002).

2.3.1 Effects of Risk Aversion

Risk-averse individuals tend to overestimate the likelihood of loss (Sitkin & Weingart, 1995). This tendency is a main factor in the impact of risk-aversion on the risk-taking processes, such as in decreasing the interest to purchase financial investments (Howcroft, et al., 2003; Shum & Faig, 2006) or increasing information searching (Taylor & Dunnette, 1974; Welsch & Young, 1982; Yeoh, 2000)

Research demonstrates the negative direct effects of risk aversion on individual risky decision-making behavior (Howcroft et al., 2003; Sitkin & Weingart, 1995), such as financial investment decisions (Donkers & Soest, 1999; Shum & Faig, 2006). Studies have pointed out that risk-averse decision-makers tend to overrate the likelihood of loss relative to the likelihood of gain, and thus avoid making riskier choices (Sitkin & Weingart, 1995). Pennings and Smidts (2000) conclude that more risk-averse individuals will "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 advice when decisions involve a high degree of uncertainty and importance (Howcroft et al., 2003; Lee & Cho, 2005).

The positive effects of risk aversion on information searches are well demonstrated (Taylor & Dunnette, 1974; Yeoh, 2000; Money & Crotts, 2003). 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 have supported their model that the propensity for risk-taking has a significant negative association with the amount of information (Taylor & Dunnette, 1974; Yeoh, 2000). Specially, more risk-averse individuals favor seeking help by utilizing professional information (Money & Crotts, 2003; Welsch & Young, 1982), such as consulting for information from an agent (Money & Crotts, 2003). Also, according to Taylor's (1974) individual risk taking logic, individual information searches development after assessment of loss. This loss-overestimating tendency from risk-averse individuals may increase reliance on heuristics, a method of information searches (Shah & Oppenheimer, 2008) to reduce potential loss. Hence, we test the following hypothesis:

Hypothesis 6: Risk aversion negatively influences investor preferences for (a) stocks/options investments or for (b) mutual funds investments.

Hypothesis 7: Risk aversion positively influences an investor's (1) digital information search, (2) advice-seeking information search, or (3) use of heuristics.

We also investigate the moderating role of income in our proposed extended information search model. Research studies point out that investors with different income levels take risks differently because of differences in risk aversion (Donkers & Van Soest, 1999; Peress, 2004) and in information acquired (Peress, 2004). Studies on

individual investment decision-making find that the rich increase their information search (Fodness & Murray, 1999; Peress, 2004) and hold a larger portion of their portfolios in financial investments (Donkers & Van Soest, 1999). They become more likely to obtain costly information with a higher precision (Peress, 2004). More information acquisitions with higher precision may induced them to purchase more high risk investments, such as stocks. In this light, we explore and examine the moderating effect of income on the information development in investment decision-making, and our hypothesis is:

Hypothesis 8: *Income has a significant moderating effect on the proposed extended information search model.*

3. Research Method

3.1 Instrument Development

To evaluate investor opinions, attitudes and behavioral intentions in individual investment decision-making, the survey instrument measurement used a psychometric scale developed from the literature as follows. In this study, *risk aversion* was defined as an investor's current tendency to avoid risks in the gain domain, based on prospect theory (Kahneman & Tversky, 1979), and was measured with three items that reflect the tendency to realize economic gain (Kahneman & Tverskey, 1979; Shefrin & Statman, 1985).

The concept of *heuristics* in this article refers to the simplification of information searches based on intuitive judgment (Shah & Oppenheimer, 2008; Tversky & Kahneman, 1974). Three items for the construct of *heuristics* measured the investor's judgment of good investments based on information from companies with high sales growth, strong earnings, and a history of prior strong performance.

Three items for the construct of *digital information search* 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 (Nagy & Obenberger, 1994). Three items for the construct of *advice-seeking information search* 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 & Cho, 2005, p. 118). Preferences for financial investments, according to the control orientation (Warren et al., 1990), were measured by four items to reflect the tendency of investor's preferences for different financial investments. The items of *stocks/options investments* included stocks, futures, and options. The items of *mutual funds investments* included domestic and foreign mutual funds (Peress, 2004; Warren et al., 1990).

Detailed measurement items for six constructs with reference sources are shown in the Appendix. All items were measured on a five-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 investments. The Cronbach's α of scales was acceptable (Nunnally & Bernstein, 1994) with a minimum score being above 0.7.

3.2 Data Collection and Descriptions

Data was collected using a questionnaire survey administered through interviews. The survey was conducted in five securities companies and five banks in Taipei, Taiwan by eight trained interviewers who are EMBA students. They worked in the banks and securities companies. The chosen subjects were currently holding stocks or had experience purchasing financial 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 26-40 year old age group and 28.6% were older than 40 years old; 53.1% were married; 76.8% had at least a university degree; and 52.6% earned annual incomes of US $20,000 or more.

3.3 Data Analysis and Results

Testing for the existence of common method variance was conducted because the data was self-reported. According to Harman's one-factor test (Podsakoff & Organ, 1986), exploratory factor analysis was performed, and the results showed the presence of six distinct factors with eigenvalue greater than 1.0, rather than a single factor. Moreover, these six factors together accounted for 74.106 percent 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, Fan. & Kohli, 2002). Hence a common method variance was not of particular concern in this study.

For the general model, a data analysis was performed following a two-stage methodology (Anderson & Gerbing, 1988) where the development of the measurement model was the first stage and then, the evaluation of a structure model was the second stage. LISREL 8.5 was used for data analysis with confirmatory factor analysis (CFA) as the initial stage and path analysis for the latter stage.

Then we use a two group approach (Byrne, 1998; Morton & Koufteros, 2008) by AMOS to test the moderating effects of income within the model. By splitting the sample (n= 378) at the median income, we divided the income categories into under twenty thousand US dollars and over twenty thousand US dollars subgroups, which can be defined as a low income group and a high income group.

3.3.1 Developing Measurement Model with CFA

A confirmatory factor analysis (CFA) is conducted to validate the critical factors of risk aversion, digital information search, advice-seeking information, heuristics, stocks/options investment preference, and mutual funds investment preference.

The CFA showed acceptable fit indices (Gefen, Straub, & Boudreau, 2000; Hatcher, 2006) with a 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 is assessed by how closely related two measures are with the same construct, and these two measures to some degree are akin to internal consistency between items of a measure (Viswanathan, 2005). In this study, 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 & Gerbing, 1988). Second, the composite reliabilities (CR) for each construct must be at or above 0.7 (Fornell & Larcker, 1981) and third, the average variance extracted (AVE) for each construct should exceed 50 percent (Fornell & 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 the AVE for each construct was greater than 0.5, with values from 0.51 to 0.66. Thus convergent validity is demonstrated.

Table 1. Results of reliability and convergent validity testing

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

Discriminant validity Discriminant validity is obtained if the measure of a construct is not correlated with measures of other constructs to which it is not supposed to be related (Viswanathan, 2005). The chi-square difference test (Anderson & Gerbing, 1988) was used to assess discriminant validity. We computed the χ2 difference for the original measurement model with its six latent constructs against the fifteen other possible alternative measurement models with five latent constructs, where the expected correlation between the two constructs of interest was fixed at 1. The result that all χ2 difference statistics were significant indicates that the original measurement model was significantly better than all other possible alternative measurement models. Thus this test supported the discriminant validity.

3.3.2 Testing of the Structural Model

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

Table 2. Hypothesis results for the structural models

| Research hypothesis	Full sample (n=378)		High income (n=199)		Low income (n=179)		High - Low
	Path coefficient	t-value	Path coefficient	t-value	Path coefficient	t-value	Difference
H1a:DIGIT→STOCK	- 0.06	-0.96	0.3	0.24	-0.1	-0.8	0.4
H1b:DIGIT→MUTUAL FU.	0.04	0.68	-0.22	-1.18	0.22	1.53	-0.44*
H2a:ADVICE→STOCK	-0.05	-0.79	0.1	0.08	-0.32***	-3.34	0.33
H2b:ADVICE→MUTUAL FU	0.19 **	2.89	0.24*	2.13	0.23*	2.28	0.01
H3a:HEURIS→STOCK	0.13 +	1.72	0.05	0.54	0.21*	2.22	-0.16
H3b:HEURIS→MUTUAL FU	0.23 **	3.15	0.31*	2.04	0.24*	2.35	0.07
H4:DIGIT→ADVICE	0.20 **	3.21	0.4**	2.68	0.23+	1.81	0.17
H5:DIGIT→HEURIS	0.25 ***	4.05	0.36***	2.82	0.36*	2.57	0
H6a:RISK AVERS→STOCK	- 0.23 ***	-3.41	-0.36+	-1.76	0.02	0.21	-0.38
H6b:RISK AVERS→ MUTUAL FU	0.02	0.30	-0.3	-1.27	0.25+	1.87	-0.55*
H7-1:RISK AVERS→DIGIT	0.21 ***	3.58	0.17	1.50	0.24***	3.08	-0.07*
H7-2: RISK AVERS→ ADVICE	0.13 *	2.12	0.22	1.18	0.21*	1.99	0.01
H7-3:RISK AVERS→ HEURIS	0.32 ***	5.22	0.53**	2.67	0.48***	3.66	0.05

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

Path analysis In terms of information search aspects, heuristics were found to have a significantly positive effect on *stocks/options and mutual funds investment preference*, supporting H3a and H3b (β= 0.13, p<0. 1 and β= 0.23, p<0.01). *Advice-seeking information search* was found to have a significantly positive effect on *mutual funds investment preference*, supporting H2b (β= 0.19, p<0.01), but it did not have this effect on *stocks/options investment preference*, not supporting H2a (β= -0.05, n.s.). *Digital information search* was not significantly related to either stocks/options or mutual funds investment preference, not supporting H1a and H1b (β= -0.06, 0.04, n.s.). In addition, *Digital information search* was found to have significantly positive effect on *advice-seeking information search*, supporting H4 (β= 0.20, p<0.01), and on *heuristics*, supporting H5 (β= 0.25 p<0.001).

Risk aversion was found to have a significantly negative effect on *stocks/options investment preference*, supporting H6a (β= -0.23, p<0.001), but it did not have the same effect on *mutual funds investment preference*, not supporting H6b (β= 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* (β= 0.21, p<0.001, β=0.13, p <0.05, and β=0.32, p <0.001 respectively), supporting H7-1, H7-2 and H7-3.

The path coefficients for the full-sample model are presented in Figure 2a. In stocks/options investment decision-making, the findings suggest that risk aversion is a stronger determinant than information search aspects.

In mutual funds investment decision-making, information search is a successful risk-reducing strategy, where heuristics and advice-seeking information searches have strong and significantly positive effects on individual investment preferences.
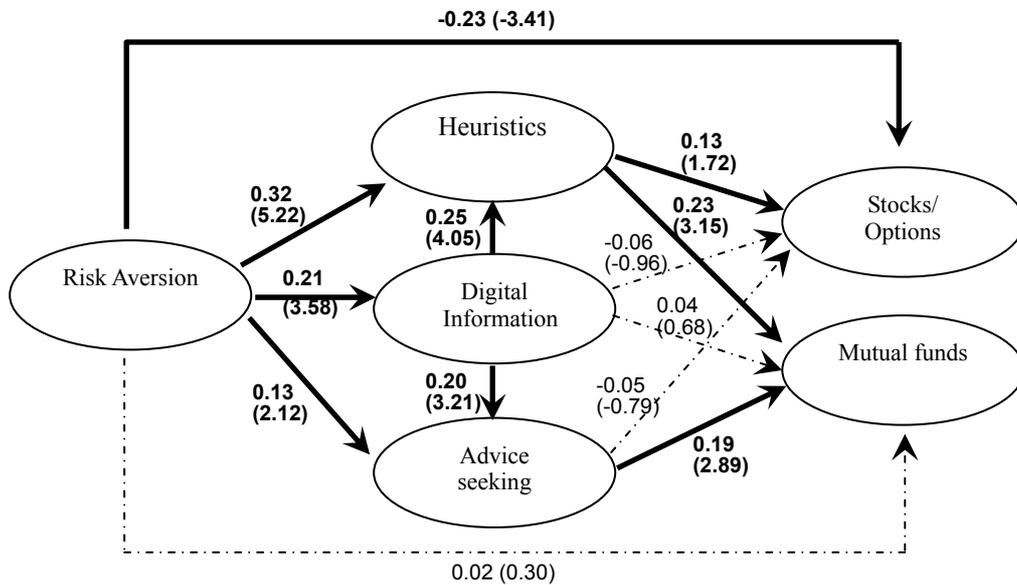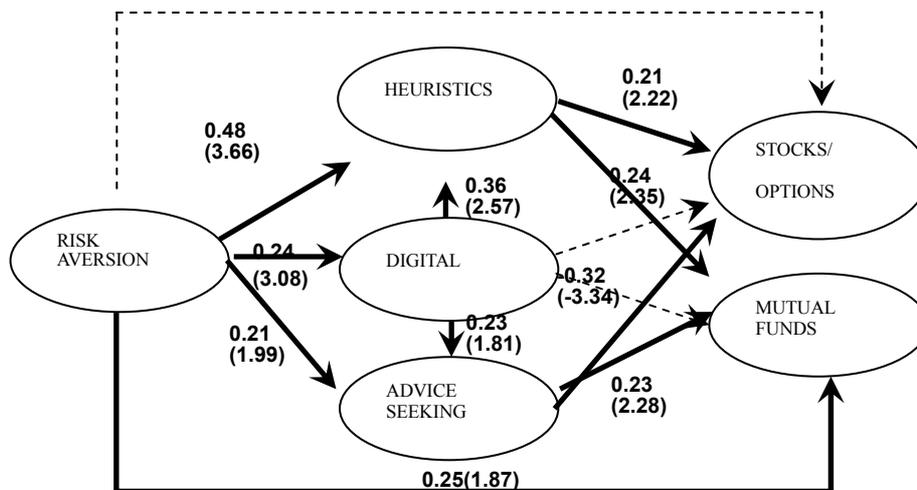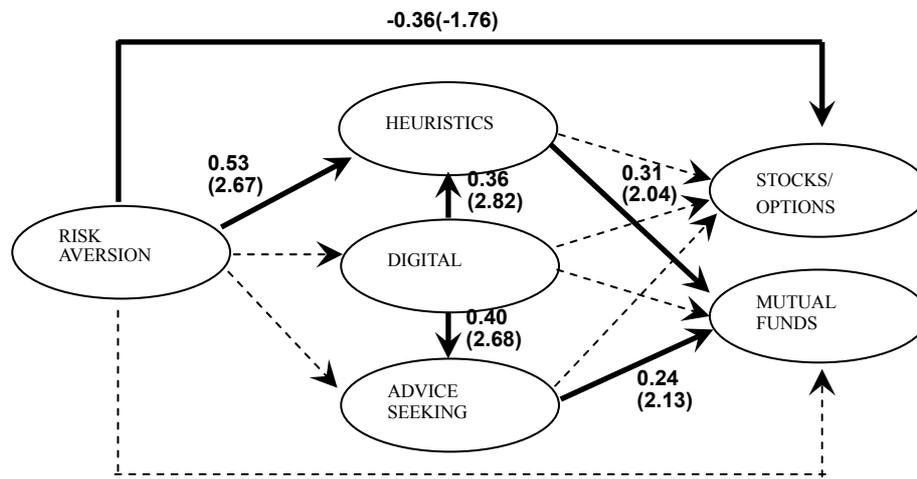

(a) Full-sample (n = 378)

Chi-square/*df* = 1.937, NNFI=0.95, CFI=0.96, GFI=0.94, AGFI=0.92, RMR=0.039 and RMSEA=0.050

Values in parentheses are t-statistics, t-statistics greater than 1.65 are significant at $p < 0.1$, 1.97 for $p<0.05$, 2.60 for $p<0.01$, and 3.34 for $p<0.001$

Paths in dash were unsupported, hypotheses in **bold** were supported

(b) Low-income Group [n = 179]

(c) High-income Group [n = 199]

Figure 2. Path models by group

3.3.3 Moderating Effects of Income

We use a two group approach to test the moderating effects of income within the model. The first step is an evaluation of measurement equivalence. Having established acceptable measurement invariance, the second step is to examine the equivalence of the structural coefficients across the high-income and low-income groups.

The results of the first step for the invariance tests across income are presented in Table 3. First, the result that the $\chi2$ difference statistics between models 1 and 2 was insignificant (p = 0.09) indicates invariant factor loadings across the high-income and low-income groups. Next, the result that the $\chi2$ difference statistics between models 2 and 3 was insignificant (p = 0.49) indicates that the factor loadings and factor intercorrelations are held constant across groups. Then, the result that the $\chi2$ difference statistics between models 3 and 4 was significant (p = 0.00) suggests that the measurement errors are not completely invariant across the high-income and low-income groups. However, the error term differences were not deemed to be severe enough to be particularly concerned in this two group approach (Morton & Koufteros, 2008, p. 506) since the differentiation of variability's on measurement errors may be expected (MacCallum & Tucker, 1991). Finally, we compare the $\chi2$ of model 3 to the $\chi2$ of model 5 with invariance for factor loadings, factor intercorrelations and structural coefficients. The result that the $\chi2$ difference statistics between models 3 and 5 was significant (p = 0.00), supporting H8, suggests that a significant difference exists in the path coefficients across the two groups.

The second step involves tests of individual equivalence of path coefficients across income groups by a chi-square difference test, as shown in Table 2. Figures 2b and 2c show the resulting path models. A low-income subgroup model is consistent with the full-sample model in the development of information search, except when the path forms a risk aversion to investment preferences and the path from advice-seeking information search to stocks/options preference (Figure 2b). For high-income respondents, this result suggests that information searches play no role in stocks/options preferences, and heuristics play a powerful development of information search between risk aversion and mutual funds preference (Figure 2c).

Table 3. Invariance tests across income

Model	$\chi2$	df	$\chi2/df$	RMR	GFI	AGFI	CFI	Nested Models	$\chi2$	df	p
1. Base model	305.64	182	1.68	0.05	0.91	0.87	0.94				
2. Equal loadings	322.01	192	1.68	0.05	0.91	0.87	0.94	2-1	16.37	10	0.09
3. Equal loadings, Factor intercorrelations	322.48	193	1.67	0.05	0.91	0.87	0.94	3-2	0.47	1	0.49
4. Equal loadings, Factor intercorrelations, measurement errors	362.40	209	1.73	0.05	0.90	0.86	0.93	4-3	39.92	16	0.00
5. Equal loadings, Factor intercorrelations, measurement errors, structural coefficients	385.47	222	1.74	0.06	0.89	0.87	0.92	5-3	62.99	29	0.00

4. Discussion

This study is an attempt to better understand information search development. By extending the topic of information search to discuss heuristics reliance, and by reporting on two dimensions of stocks/options and mutual funds investment, we successfully confirm our proposed model and address the following discussion and contributions.

One contribution lies in empirically identifying the effect of heuristics on individual investment preferences, thereby expanding the understanding of information searches. Heuristics have the strongest positive influence on both stocks/options and mutual fund investment choices, especially for the latter. This result echoes Kozup's et al. (2008) demonstration of a significant influence of prior fund performance on fund evaluation. As Krabuanrat and Phelps (1998) suggest, using heuristics improves rapid learning and adaptivity in dynamic investment environments. Possibly, by learning from their investment experience (Shah & Oppenheimer, 2008), investors find that some accuracy of heuristics may help them to achieve expected returns (Peress, 2004) in a simple way. This simple way provides readily available and easily understood information (Kahneman & Frederick, 2002) to evaluate a complex investment task, and thus may induce investors to have more interest in financial investments.

Our results suggest that risk aversion could indeed be a powerful determinant in risk-taking for individual investment choices. The findings show that the significant direct negative effect of risk aversion on stocks/options investment choices, supporting risk-aversion's traditional direct effect is consistent with Sitkin and Weingart (1995), Pennings and Smidts (2000), and Howcroft et al. (2003). Furthermore, the results indicate a great indirect effect of risk aversion on mutual fund choices through information searches. Individuals with greater risk aversion are more likely to increase information searches. This conclusion is consistent with those reported by 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. This finding is one contribution of this paper.

If the investors' information searches development is greatly impacted by individual risk aversion and heuristics reliance, this result implies that the movement to teach financial students to recognize investor psychology is not new (Shefrin, 2000), but might be required to be more extensive.

We find significant support for income differences in individual information searches in investment decision-making. The result suggests that the role of risk aversion is strengthened for the low-income group, and that a strong follow-through exists from risk aversion to all three types of information searches to financial investment preferences. For the high-income group, risk aversion has limited impact on information searches except heuristics reliance. Moreover, information searches development plays no role in stocks/options preference. Two implications thus could be addressed. First, this result implies that provision of financial information for different income groups may be needed, and meantime investor psychology is suggested to be taken into serious consideration. Second, further research is necessary to explore whether high-income individuals use some other information searches development to be a risk-reduced strategy in stocks/options investment decision-making.

An information searches development route, from digital information search to both advice-seeking information searches and heuristics reliance, then to mutual funds preference in the two models by income are remarkably consistent. Thus, the practical implication for professional advisors could be addressed. First, this article demonstrates the value of enhancing the sophistication of the information that a counselor provides. It is possible that investors who are more likely to search digital information may understand the suffering of being overloaded from unorganized digital information. This echoes Thaler's et al. (1997) 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 & Stateman, 1997; Howcorft et al., 2003; Lee & Cho, 2005). Second, since investors tend to reduce the information search effort in financial decision-making by heuristic simplification, this tendency might lead to severe errors (Tversky & Kahneman 1974). Advisors could show the likelihood of judgment bias due to a heuristic based on psychological cognitive judgment (Tversky & Kahneman 1974; Baker & Nofsinger 2002). More balanced information search, including supporting information and conflicting evidence (Jonas & Frey 2003), might be a clear exposition.

4.1 Limitations

There are several limitations of this study. First, this article finds that digital information searching is the one most often considered in individual investment decision-making (due to the highest mean in the information search aspect, 3.79, as shown in Table 1). However, digital information search has little effect on individual

investment intentions. This finding does not match the original assumptions of H1a and H1b. 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 discussions, 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 individual investment intention, and may induce investors to seek more help from experts to reduce information asymmetry.

Second, some factors related product knowledge, product involvement and consumer experience have strong relationship with information search (Guo, 2001). This article does not include investors' investment knowledge and product involvement as studied variables. Although the respondents in this article have investment experience, their perceived levels of investment knowledge and understanding might be different. Also, the investors' knowledge/understanding and product involvement may influence their information searching behaviors and investment choices (Howcroft et al., 2003). We also did not include other important factor such as problem framing (Tversky & Kahneman, 1981) that might effect individual risk perception under uncertainty in choice environment. These are areas for future research.

Third, this article conducts Harman's one-factor test (Podsakoff & Organ, 1986) to testing for the existence of common method variance. This factor analysis does not indicate a common method influencing our results. However, this technique has limitations such as "insufficient sensitivity to detect moderate or small levels of common method variance effects (Podsakoff et al. 2003, Malholtra, Kim, & Patil, 2006)." Future research might further checked for common method variance by the marker variable approach proposed by Lindell and Whitney (2001) to address the problems related to Harman's test. Following Lindell & Whitney (2001), questionnaire design in future research need to include at least one marker variable that meet conditions as follows: The marker variable "should be measured by a multi-item scale, and the reliability of this scale (Lindell & Whitney, 2001, pp 119)." And the marker variable "must be theoretically unrelated to at least one of the other variables (Lindell & Whitney, 2001, pp 119)."

Fourth, this study is built on the following theoretical framework: risk attitudes →risk-reducing strategies → decision to buy. Our data are from a cross-sectional survey, which might preclude the direction of causality between variables. These results may be influenced by individual changes over time. Our model needs to be confirmed and tested by further examination in longitudinal studies. Moreover, although this research model is build on the risk-taking theoretical framework, we do not run rival models to see whether they would or would not better explain the covariance structure compared to that of the hypothesized model. This might also limit alternative possible explanations in cross-section survey. These are areas for further research.

4.2 Conclusions

This study extends the information search aspects to discuss heuristics reliance, a simplified information search method, on individual investment choices. We hypothesize that risk aversion has a double effect on the preferences for financial investments: a traditional direct effect and an indirect effect via the information searches. Furthermore, we conduct an investigation for the moderating effects of income.

Reporting on the two dimensions of stocks/options and mutual funds investment, the findings show that individuals with greater risk aversion tend to seek out more diverse information. A mass of digital information through more advice-seeking information search and heuristics reliance can increase investor interest in mutual fund investments. We further clarify income differences in individual information searches in investment decision-making. The empirical results expand understanding of individual information search in investment decision-making.

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Appendix. Detailed measurement items for six constructs

Constructs		*Items*	*Sources*
Stocks/options investment	DIR1 DIR2	I prefer to inevest in stocks. I prefer to invest in futures/options.	Warren et al., (1990), Fisher & Statman (1997), Peress (2004)
Mutual funds Investment	IND1	I prefer to invest in domestic mutual funds.	
	IND2	I prefer 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 & Tversky, (1979), Shefrin & 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 & Obengerger (1994), Lee & 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.	