國 立 交 通 大 學

經營管理研究所

博士論文

No. 138

資訊搜尋在投資選擇中的角色：數位資訊、尋求忠告與捷思

The Role of Information Searches in Investment Choices: Digital Information, Advice Seeking and Heuristics

研 究 生：曾薰瑤

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中華民國一〇〇年五月

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國 立 交 通 大 學

經 營 管 理 研 究 所

博 士 論 文

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中華民國一〇〇年五月

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國立交通大學經營管理研究所博士班

中文摘要

　　購買風險投資是創造個人財富的方法之一，當個人面臨有關投資結果的不確定時，會進行資訊搜尋作為減少風險的策略。過去許多相關的研究多聚焦在數位資訊的搜集與尋求忠告訊息的討論，本研究嘗試在資訊搜尋面向上、擴展探討個人對於捷思（一種簡化的資訊搜尋方法）的依賴。其次，我們也將檢視個人的風險趨避態度對於本文中資訊擴展模型的影響效果。在投資選擇方面、本文區分為直接投資（例如：股票/選擇權）與間接投資（例如：基金）兩方面進行探討。採用問卷調查方式、蒐集到有效樣本共 378 位有投資經驗的投資人為資料。以兩階段分析程序進行資料分析。第一階段，進行驗證性因素分析，以評估測量構面的有效性。第二階段，以路徑分析檢視研究模型的結構關係。研究結果發現：風險趨避顯著直接影響投資人的股票/選擇權投資偏好，但是經由資訊搜尋間接影響投資人的基金投資偏好。愈具有風險趨避傾向的個人愈偏好搜尋資訊。投資人尋求忠告與依賴捷思正向影響他們對於基金的偏好。此外，

投資顧問應提升所提供資訊的專業性與準確性，特別是對於較具有風險趨避傾向的投

資人。最後，本研究也提出相關的實務意涵與道德議題意涵。

關鍵字： 風險趨避，資訊搜尋，數位資訊，尋求忠告訊息，捷思
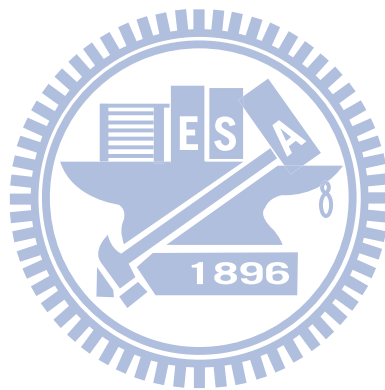
The Role of Information Searches in Investment Choices: Digital Information, Advice Seeking and Heuristics

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ABSTRACT

Purchasing risky investments can be a means to create individual wealth. 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. Specifically, this article reports on two dimensions of direct (e.g., stocks/options) and indirect (e.g., mutual fund) investment. We test our model with a sample of 378 experienced investors by self-reported measurement. Data analysis is performed in two-step analytical procedures. The first stage, confirmatory factor analysis is conducted to assess the validity of the measures. The second stage, the

structural relationships are examined by path analysis. 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. Individuals with more risk aversion are more likely to search information. More advice-seeking information searching and heuristics reliance through demands of digital information positively influence mutual fund investment preferences. 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.
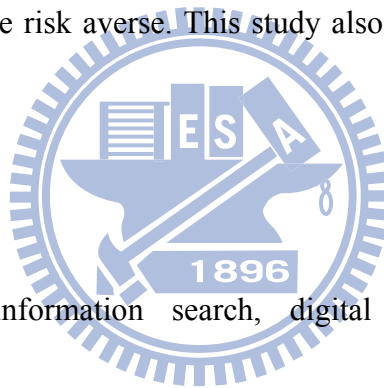
Keywords: risk aversion, information search, digital information, advice-seeking information, heuristics

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曾薰瑤
民國一○○年五月

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Chapter 1. Introduction

1.1. Research background

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, Hewer, and Hamilton, 2003; Fisher and Statman, 1997), and then make an informed decision. Individual information acquisition usually comes from digital information on financial measures (Clark-Murphy and Soutar, 2004; Nagy and Obenberger, 1994) and from 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. This advance also results in an information explosion (Shenk, 1997; Johnson, 2001; Lee and Cho, 2005) and the complexity of investment decision-making (Fisher and Statman, 1997). 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, such as viewing a company with strong prior performance as a good investment (Baker and Nofsinger, 2002; Shefrin, 2000), 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 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 searching behavior (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

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control-orientation by investors (Warren, Stevens and McConkey, 1990), directly-controlled investment (e.g. stocks) and indirectly-controlled investment (e.g. mutual funds), or "direct investment" and "indirect investment" for short, respectively. We thus expect to better understand the effect of information search in investment choice variation.

1.2. Research objectives

Investor searches information for risk-reducing strategies in risky investment decision-making (Taylor, 1974; Lee and Cho, 2005; Howcroft, Hewer, and Hamilton, 2003; Fisher and Statman, 1997). In other word, investors seek to achieve expected returns "by decreasing the level of associated uncertainty through information search" (Fodness and Murray, 1997). Moreover, research finds that risk aversion is one of major psychological determinants of risky investment choices (Howcroft, et al., 2003; Shum and Faig, 2006) and information searching behavior (Cho and Lee, 2006; Money and Crotts, 2003; Taylor and Dunnette, 1974; Welsch and Young, 1982; Yeoh, 2000).

To better understand the effect of information search in investment choice variation, we extend the information search aspects to discuss heuristics reliance. Besides, we integrate an individual psychological factor, risk aversion, and information search aspects in risky investment decision-making. Focusing on two types of risky investments, two objectives of this study are as follows:

1. To indentify the effects of extended information searches, including digital information, advice-seeking information and heuristics, on risky investment choices.

2. To examine the relationships among the risk aversion toward risky investment choices via information searches.

1.3. Research questions

According to the research background and research objectives, this study attempts to extend the investigation of information search to discuss heuristics reliance, a simplified information search method, in risky investment decision-making. We also examine the effect of risk aversion on our extended information search model. Two main research questions are proposed:

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?

1.4. Research flow

This study addresses two research questions. To answer them, a literature review of previous studies is conducted and hypotheses are developed. A survey form experienced investors is conducted, the research data is collected and compiled for the subsequent analysis. The research flow is presented in figure 1.1.

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┌─────────────────────────┐
│   Identifying Research   │
│        Objective         │
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┌─────────────────────────┐
│     Literature Review    │
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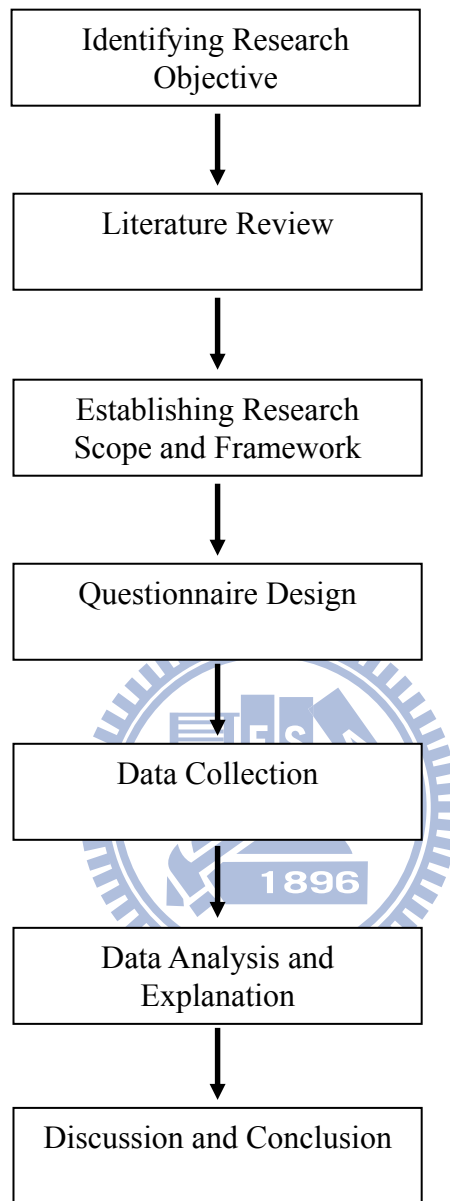
Figure1.1 Research Flow

Chapter 2. Literature Review

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, studies on risk-taking in consumer behavior have focused on perception of risk. Some researchers argue that "risk attitudes and risk perceptions play a key role in understanding consumers' risk behavior" (Pennings et al. 2002, p. 92), particularly in financial and health-related domains (Cho and Lee, 2006; March and Shapira, 1987; Pennings and Smidts, 2000; Pennings et al., 2002). Empirical studies have shown that the inclusion of risk attitude is a necessary variable in studying consumer risky decision making behavior (Cho and Lee, 2006; Pablo, 1992; Sitkin and Weingart, 1995), since it influences not only individual behavioral choices facing risk (Donkers and Soest, 1999; Sitkin and Weingart, 1995) but also strategic development reducing risk (Cho and Lee, 2006; Money and Crotts, 2003; Taylor and Dunnette, 1974). However, few empirical studies have examined risk attitude affecting individual investment

choices through information search. This article endeavors to fill this gap. In this study, we focus on the risk attitude to investigate the effect of risk aversion on investors' risky investment choices.

2.1. Information Search

Moutinho (1987) defines information search as "an expressed need to consult various sources prior to making a purchase decision" (Fodness and Murray, 1997, p. 505). Information plays a critical role in the model of risk-taking in consumer behavior formulated in Taylor (1974). 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 in financial decision-making (Nagy and Obenberger, 1994; Shum and Faig, 2006).

Digital information   Digital information based on financial measurements is valuable. Previous studies examine the determinants influencing individual investor behavior, based on economic perspectives. Results find some crucial determinants on corporate accounting information (Nagy and Obenberger, 1994), including expected dividends (Baker and Haslem, 1974; Clark-Murphy and Soutar, 2004; Nagy and Obenberger, 1994), 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 (Baker and Haslem, 1974; Clark-Murphy and Soutar, 2004; Nagy and Obenberger, 1994).

For example, Baker and Haslem (1973, 1974) use data of a total of 851 individual investors from five five stock brokerage firms by mail questionnaires. They find that individuals had different information needs for risky investment decisions, especially when concerned with expectations about the company's future. Moreover, though factor analysis Baker and Haslem's (1974) data shows that, according to the elements of information from company reports, dividends, future expectation, and financial stability are the three most important consideration factors in an individual's stock investment. Nagy and Obenberger (1994) examine the factors influencing individual investor behavior, including various utility-maximization and behavioral variables. They find that accounting information criteria (such as expected earnings and financial statements) as well as classical wealth-maximization criteria (such as risk minimization and expected dividends) could capture major investor consideration by employing 34 diverse variables. Clark-Murphy and Soutar (2004) use a conjoint analysis approach to investigate the attributes influencing individual decision-making behavior in stocks purchasing. The results show that these financial measures (such as dividends and R/E ratio) are obviously related with investment

decision-making behavior but less important than company's management when investors based their investment decision on wealth-maximization criteria.

Digital information search is the primary consideration in individual risky investment decisions, even combined with various other variables such as personal-financial-need factor and advocate-recommendation factor (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). Thus, we expect that digital information search will increase individual interest in risky investments because investors might reduce their uncertainty via greater understanding of company's financial status.

Advice-seeking information Advice-seeking information search becomes necessary in risky investment decision-making. Investors generally seek advice from professional financial advisors (Baker and Nofsinger, 2002; Shum and Faig, 2006), friends/relatives (Baker and Nofsinger, 2002; Nagy and Obenberger, 1994), and magazines/brochures from financial institutions (Lee and Cho, 2005). 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, 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) suggests 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. They find that professional advice positively influences the decision to hold stocks.

2.2. Heuristics

Heuristics, 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 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." Some studies on why people employ heuristics have noted that individuals will suffer from both information overload (Lee and Cho, 2005; Peress, 2004) and investment complexity (Fisher and Statman, 1997; Warren, Stevents, and McConkey, 1990) due to bounded rationality (Simon 1955, 1956, 1990). Therefore, investors may employ heuristics as a method to reduce the effort they expend on information processes by simplification, such as the information from attribute substitution (Kahneman and Frederick, 2002). In this study, heuristics refer to a simplified information search in investment decision based on intuitive judgment, such as viewing a company with strong prior performance as a good investment.

Heuristics and cognitive biases

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). 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 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 the representativeness bias (Baker and Nofsinger, 2002; Shefrin, 2000), a type of cognitive bias (Tversky and Kahneman, 1974). Moreover, Baker and Nofsinger (2002) examine the psychological biases caused by investors' cognitive. They agreed that investors tended to employ shortcuts by using the representativeness heuristic, called heuristic simplification, to decrease the amount and complexity of information.

Using heuristics in decision-making

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, Svedsater, and Garling, 2007). Kozup, Howlett, and Pagano (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.

2.3. Risk aversion

Risk aversion refers to an individual's current tendency to avoid risks (Sitkin and Weingart, 1995). Risk aversion affects personal decisions under uncertainty (Shefrin and Statmam, 1985; Sitkin and Weingart, 1995; Weber, Blais and Betz, 2002). In behavioral finance, Kahneman and Tversky (1979) state that an individual 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 (Sitkin and Weingart, 1995; Weber, et al., 2002).
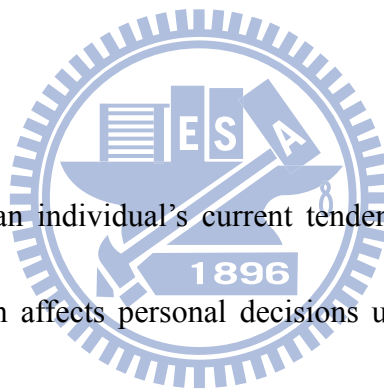
Risk aversion and risky investment   Research clearly demonstrates the negative

effect of risk aversion on individual risky decision-making behavior (Fisher and Statman,

1997; Howcroft et al., 2003; Sitkin and Weingart, 1995; 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. Donkers and Soest (1999) use data from a

Dutch survey and find that the influence of risk aversion on interest in financial risky

investments is highly significantly negative. Shum and Faig (2006) demonstrate that the

effect of risk aversion on stock holding is negative and highly significant, being consistently

significant across time. Pennings and Smidts (2000) find 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. 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 and information searches   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.

Effects of risk aversion are well demonstrated in the studies on information searches (Money and Crotts, 2003; Taylor and Dunnette, 1974; Yeoh, 2000). For example, Taylor and Dunnette (1974) use data of 79 male line mangers. They find that risk-taking propensity has a significant negative association with the amount of information. Money and Crotts (2003) use data from a matched sample o f1042 German and Japanese visitors to the US. They find that more risk-averse individuals favor to seeking help from professional information, such as information from travel agent. Welsch and Young (1982) interview 53 entrepreneurs. They find that entrepreneurs who are less risk-taking prefer professional information.
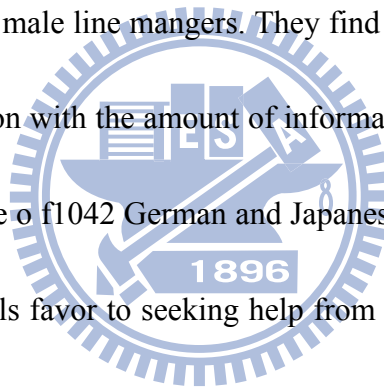
Chapter 3. Research Method

Following literature review, research method is presented. For the purpose of this study, we first introduce a concept framework based on previous researches. The following sections include hypotheses, operational definition of variables, questionnaire design, research procedure, and analysis method.

3.1. Research framework and hypotheses

The present paper follows the logic of Taylor's (1974) risk-taking theory: individual psychological factors - risk-reducing strategies - decide to buy. In this article, risk aversion is referred to individual psychological factor, information searches are referred to the development of risk-reducing strategies. We change decision to buy to investment preferences. We thus propose that risk aversion leads to information searches, in turn lead to investment preferences. In addition, in consideration of psychological factors in investment decision, we also examine the influence of risk aversion on investment preferences. Figure 3.1 shows the proposed research mode. 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 conclude 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 representiveness 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. Research shows that digital information search is a crucial determinant in risky investment decision-making (Baker and Haslem, 1974; Clark-Murphy and Soutar, 2004; Nagy and Obenberger, 1994). 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 expect that information searches positively affect individual risky investment preferences.
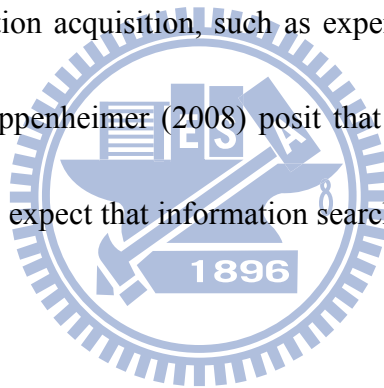
H1 Investor's digital information search positively influences his/her preferences for (a) direct risky investments or for (b) indirect risky investments.

H2 Investor's advice-seeking information search positively influences his/her preferences for (a) direct risky investments or for (b) indirect risky investments.

H3 Investor's heuristics reliance positively influences his/her preferences for (a) direct risky investments or for (b) indirect risky investments.
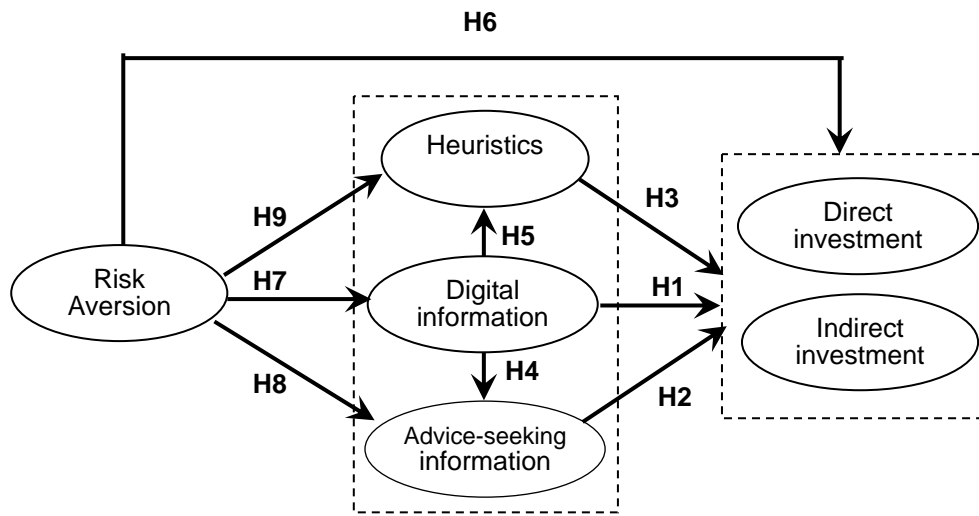
Figure 3.1. Research Model
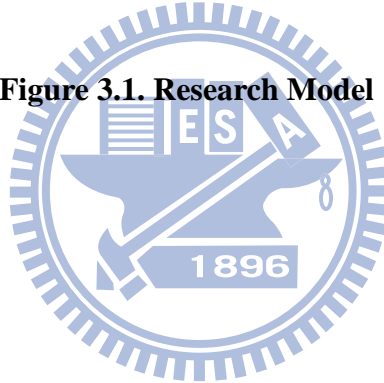
Recent advances in the technology of information search make the acquisition of information much easier and less expensive than before (Johnson, 2001). This increased information may generate information overload for investors (Gifford, 2001). In this light, we expect that investors who are more like to search digital information understand that more digital information is not always better (Thaler, Tversky, Kahneman and Schwartz, 1997). 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 (Ratneshwar and Chaiken, 1991), to reduce the complexity of information used. In order to find the needed information, unsophisticated investors may prefer to seek professional help (Fisher and Statman, 1997; Howcroft et al., 2003; Lee and Cho, 2005). Accordingly, we also propose hypotheses that digital information search positively affect both advice-seeking information search and the use of heuristics.

H4 Digital information searches positively influences advice-seeking information searches.

H5 Digital information searches positively influences 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). Hence,

H6 Risk aversion negatively influences investor preferences for (a) direct risky investments or for (b) indirect risky investments.

H7 Risk aversion positively influences investor's digital information searches.

H8 Risk aversion positively influences investor's advice-seeking information searches.

H9 Risk aversion positively influences investor's use of heuristics.

3.2. 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).

Table 3.1 Measurement items for risk aversion construct

Risk aversion	
RAV1	I would like to realize the gain as soon as the stock increases in price.
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.

Source: Kahneman and Tversky, (1979), Shefrin and Statman (1985, pp. 779)

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.

Table 3.2 Measurement items for heuristics construct

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.
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.

Source: Tversky and Kahneman (1974, p. 1126), Baker and Nofsinger (2002, p.100)

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).

Table 3.3 Measurement items for digital information search and advice-seeking information constructs

Digital information search	
DIG1	I would like to search for information about a firms' expected earnings.
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.
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.

Source: Nagy and Obengerger (1994), Lee and Cho (2005)

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).

Table 3.4 Measurement items for direct investment preference and indierect investment preference constructs

Direct investment	
DIR1	I would like to inevest in stocks.
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.

Source: Warren et al., (1990), Fisher and Statman (1997), Peress (2004)
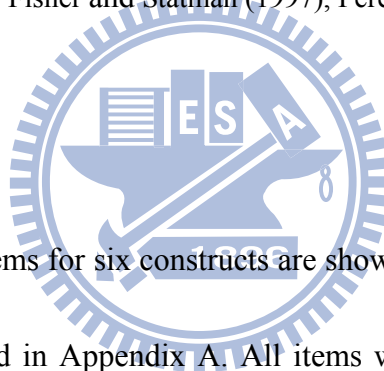
Detailed measurement items for six constructs are shown in Appendix A. The sources that we used are also presented in Appendix A. All items were measured on a five-point Likert scale (1= strongly disagree, 3= neither agree nor disagree, and 5= strongly agree). The preliminary instrument was reviewed 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 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.

3.3. Research subjects and data collection

Data was collected using a questionnaire survey administered through an interview. The survey was conducted in five securities companies and five banks in Taipei, Taiwan by eight 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.

3.4. Analysis method

Data analysis was performed according to a two-step 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 confirmatory factor analysis (CFA) as the former stage and path analysis as the latter stage.

Confirmatory factor analysis (CFA) was conducted to assess the reliability and validity of the measures. 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). Although items were dropped for violating unidimensionality, they were carefully read to make sense from a theoretical perspective (Viswanathan, 2005). Then, the structural relationships were examined by path analysis.

Chapter 4. Data Analysis

This chapter includes four sections. First, we reveal the descriptive statistics of the sample used in this study. Second, a confirmatory factor analysis (CFA) is conducted to validate the critical factors of risk aversion, digital information search, advice-seeking information, heuristics, direct investment preference, and indirect investment preference. Third, structure equation modeling is conducted to evaluate the relationships among the studied constructs. Finally, we present the hypotheses results.

4.1. Data description

This survey collected 395 responses and 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 group and 28.6% were greater 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. More detailed information is listed in Table 4.1.

Table 4.1 Characteristics of the sample

Characteristics	Number (N = 378)	Percentage
Gender		
Male	131	34.7%
Female	247	65.3%
Age		
< = 25	44	11.6%
26 - 40	226	59.8%
41 - 55	95	25.1%
> = 56	13	3.5%
Marriage status		
Married	197	52.1%
Not married	181	47.9%
Education		
Junior high school	16	4.2%
Senior high school	72	19.0%
University/college	235	62.2%
Graduate	55	14.6%
Annual income (US $)		
< 12000	67	17.7%
12000 - 20000	112	29.6%
20000 - 30000	90	23.8%
30000 – 38000	58	15.3%
> 38000	51	13.5%
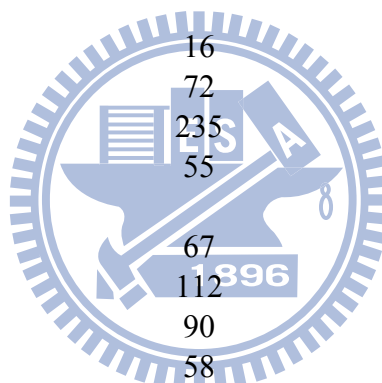
4.2. Developing measurement models

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 six distinct factors with eigenvalue greater than 1.0, rather than a single factor, as shown in table 4.2. 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 (23.512%). These results did not indicate a single-factor structure that explained the majority of covariance (Devaraj, Fan and Kohli, 2002). Hence common method variance was not of particular concern in this study.

Using confirmatory factor analysis (CFA), the measurement model was revised by dropping items that shared a high degree of residual variance with other items (Gefen, Straub and Boudreau, 2000; Gerbing and Anderson, 1988). There was no item dropped at this stage. The CFA showed acceptable fit indices (Hair et al., 2005; Gefen et al., 2000; Jarvenpaa et al., 2000; Hatcher, 2006)[1] 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

---

[1] Some characteristics of an "ideal fit" for a measurement model, according to most references (Hair et al., 2005; Bentler, 1989; Hatcher, 2006) are reviewed as follows: the CFI and NNFI have been shown to better reflect model fit regardless of sample size (Bentler, 1989; Anderson & Gerbing, 1988). CFI, NNFI and GFI are best if above 0.90, AGFI value above 0.8, and RMR values below 0.05, and the chi-square/df ratio is below 3. In addition, RMSEA is best if below 0.05, while Hu and Bentler (1999) claim that the maximum desired cut-off value should be 0.06, though Jarvenpaa et al., (2000) argue for 0.08.

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 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 percent (Fornell and Larcker, 1981). As shown in

Table 4.3, 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   Discriminant validity is obtain 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 and Gerbing, 1988) was used

to assess discriminant validity. We computed the χ^2 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 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, as shown in table 4.4. Thus this test supported the discriminant validity.

Table 4.2. Total variance explained of factor analysis

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.762	23.512	23.512	3.762	23.512	23.512
2	1.921	12.005	35.517	1.921	12.005	35.517
3	1.852	11.574	47.091	1.852	11.574	47.091
4	1.790	11.190	58.281	1.790	11.190	58.281
5	1.301	8.134	66.415	1.301	8.134	66.415
6	1.231	7.692	74.106	1.231	7.692	74.106
7	.702	4.387	78.494			
8	.589	3.683	82.176			
9	.503	3.145	85.321			
10	.474	2.961	88.282			
11	.445	2.779	91.061			
12	.363	2.271	93.332			
13	.325	2.030	95.362			
14	.313	1.958	97.320			
15	.252	1.578	98.898			
16	.176	1.102	100.000			

Note: Extraction Method: Principal Component Analysis.

Table 4.3. 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			
Direct Investment			3.28	0.75	0.60
DIR1	0.68	7.28			
DIR2	0.86	7.74			
Indirect 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

Table 4.4. Discriminant validity of the measurement model.

| Model	$\chi^2_{(df)}$	Difference in χ^2 value
Original Model	$\chi^2_{(89)} = 165.38$	
Combining risk aversion with heuristics	$\chi^2_{(90)} = 375.16$	209.78***
Combining risk aversion with digital inf.	$\chi^2_{(90)} = 845.46$	680.08***
Combining risk aversion with advice-seeking inf.	$\chi^2_{(90)} = 482.14$	316.76***
Combining risk aversion with direct investment	$\chi^2_{(90)} = 286.81$	121.43***
Combining risk aversion with indirect investment	$\chi^2_{(90)} = 307.39$	142.01***
Combining heuristics with digital inf.	$\chi^2_{(90)} = 388.42$	223.04***
Combining heuristics with advice-seeking inf.	$\chi^2_{(90)} = 401.09$	235.71***
Combining heuristics with direct investment	$\chi^2_{(90)} = 290.48$	125.10***
Combining heuristics with indirect investment	$\chi^2_{(90)} = 303.13$	135.75***
Combining digital inf. with advice-seeking inf.	$\chi^2_{(90)} = 560.99$	395.61***
Combining digital inf. with direct investment	$\chi^2_{(90)} = 321.94$	156.56***
Combining digital inf. with indirect investment	$\chi^2_{(90)} = 307.19$	141.81***
Combining advice-seeking inf. with direct investment	$\chi^2_{(90)} = 296.17$	130.79***
Combining advice-seeking inf. with indirect investment	$\chi^2_{(90)} = 306.64$	141.26***
Combining direct investment with indirect investment	$\chi^2_{(90)} = 309.54$	144.16***

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

With 1 *df*, the critical values of chi-square are 3.841 at p=0.05, 6.635 at p=0.01, and 10.827 at p=0.001.

4.3. Testing of the Structural model

First, goodness of fit indices for the structural model were checked. As shown in Figure 4.1, 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 4.5 and Figure 4.1, including the path coefficients and overall fit indices, with the following results.
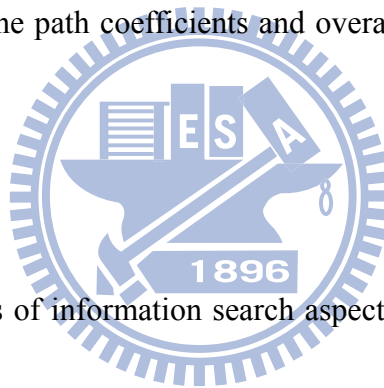
Path analysis In terms of information search aspects, *heuristics* were found to have significantly positive effect on both *direct and indirect investment preference*, supporting H3a and H3b (β= 0.13, p<0. 05 and β= 0.23, p<0.001). *Advice-seeking information search* was found to have significantly positive effect on *indirect investment preference*, supporting H2b (β= 0.19, p<0.01), but it did not have this effect on *direct investment preference*, not supporting H2a (β= -0.05, n.s.). *Digital information search* was not significantly related to either direct or indirect 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<0.001), and on *heuristics*,

supporting H5 (β= 0.25 p<0.001).

Risk aversion was found to have significantly negative effect on *direct investment preference*, supporting H6a (β= -0.23, p<0.001), but it did not have the same effect on indirect 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), hence supporting H7, H8, and H9.

4.4. Testing of indirect effects of information searches and summary

Moreover, we also examine the indirect effects of information searches in investment choices. As shown in table 4.6, 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, especially from heuristics and advice-seeking information.

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.

Table 4.5. Hypothesis results for the structural model.

| Research hypothesis	Path coefficient	*t*-value
H1a: Digital information search → direct investment	- 0.06	-0.96
H1b: Digital information search → indirect investment	0.04	0.68
H2a: Advice-seeking information search → direct investment	-0.05	-0.79
H2b: Advice-seeking information search → indirect investment	0.19 **	2.89
H3a: Heuristics → direct investment	0.13 *	1.72
H3b: Heuristics → indirect investment	0.23 ***	3.15
H4: Digital information search → advice-seeking information search	0.20 ***	3.21
H5: Digital information search → heuristics	0.25 ***	4.05
H6a: Risk aversion → direct investment	- 0.23 ***	-3.41
H6b: Risk aversion → indirect investment	0.02	0.30
H7: Risk aversion → digital informaiton search	0.21 ***	3.58
H8: Risk averiosn → advice-seeking information search	0.13 *	2.12
H9: Risk aversion → heuristics	0.32 ***	5.22

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

Table 4.6 Decomposition of total, direct, and indirect effects of variables from the path analysis

Path	Indirect effects through	Indirect effects	Direct effects	Total effects
RAV → DIR		**0.03****	**-0.23*****	**-0.20*****
RAV→HEU→DIR	0.042			
RAV→DIG→DIR	-0.013			
RAV→ADV→DIR	-0.007			
RAV→DIG→HEU→DIR	0.007			
RAV→DIG→ADV→DIR	-0.002			
RAV → IND		**0.13*****	**0.02**	**0.15*****
RAV→HEU→IND	0.074			
RAV→DIG→IND	0.008			
RAV→ADV→IND	0.025			
RAV→DIG→HEU→IND	0.012			
RAV→DIG→ADV→IND	0.008			

RAV: risk aversion, HEU: heuristics, DIG: digital information, ADV: advice-seeking information, DIR: direct investment preference, IND: indirect investment preference

**p < 0.01, ***p < 0.001

Figure 4.1. Path Analysis
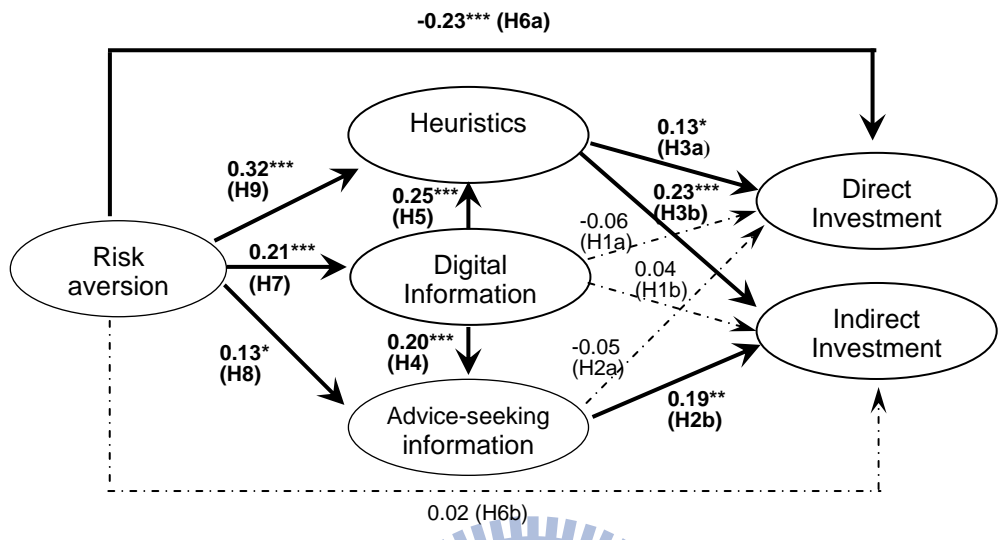
Overall fit indices (n = 378):

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

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 1.645 are significant at p < 0. 05, 2.33 for p<0.01, and 3.09 for p<0.001

Chapter 5. Discussion

This article examines two questions: Does extended information search play a crucial role in individual risk-taking in investment choice variation? And, 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.
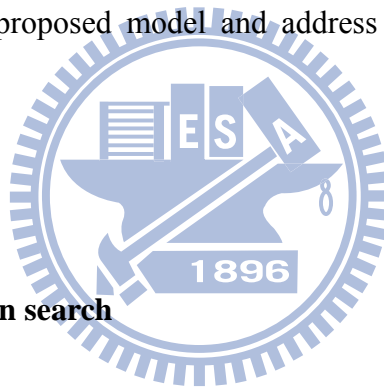
5.1. Importance of information search

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 searches.

Heuristics have the strongest positive influence on both stocks/options and mutual fund investment choices, especially for the latter. This result echoes Kozup, Howlett,and Pagano'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 4.3). 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 the one most often considered in individual investment decision-making (due to the highest mean in the information searches aspect, 3.79, as shown in Table 4.3) , but digital information search has little effect on risky 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, Zo, and Ciganek, 2010), such as statements, management discussion, and forecasts, for investment decisions. Although investors are more likely to search for digital information, they might worry about the problem of information asymmetry due to insufficient corporate disclosure (Yoon, Zo, and Ciganek, 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 searching 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).

5.2. 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 searching, especially from advice-seeking and from heuristics, may decrease individual concern with potential loss (Peress, 2004), and thus increase interest in mutual fund investment.

5.3. 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, Howlett, and Pagano, 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. Investors may be induced to purchase risky investments by trick information

presentation formats. 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.

5.4. 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.

In addition, this study has investigated the effect of determinants on individual risky investment preferences, focusing on both psychological aspects and information search aspects. These results may be influenced by demographic variables such as age, gender, education and income (Riley & Chow, 1992; Barber et. al., 1996; Shum & Faig, 2006). Future research could investigate investors' risk-taking in investment decision-making under controlling demographic variables.

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.

In this article, heuristics was measured with items by the investor's judgment of good investment based on information from companies with high sales growth, generating strong earnings, and prior strong performance. We did not include other evaluated factors such as firm reputation and feelings about products/services (Nagy and Obenberger, 1994). These are areas for future research to increase the content validity of the construct of heuristics.
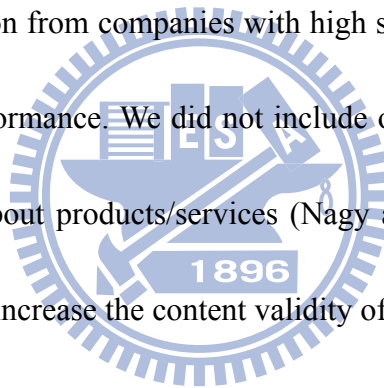
Chapter 6. Conclusion

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 A. Detailed measurement items for six constructs

Constructs		Items	Sources
Direct investment	DIR1	I would like to inevest in stocks.	Warren et al.,
	DIR2	I would like to invest in futures/options.	(1990), Fisher and Statman (1997),
Indirect Investment	IND1	I would like to invest in domestic mutual funds.	Peress (2004)
	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),
	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.	Shefrin and Statman (1985, pp. 779)
	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
	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.	(2002, p.100)
	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
	DIG2	I would like to search for informtiaon about firms' financial statements.	(1994), Lee and Cho (2005)
	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.	