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BEYOND OBJECTIVE KNOWLEDGE: THE MODERATING ROLE OF FIELD DEPENDENCE–INDEPENDENCE COGNITION IN FINANCIAL DECISION MAKING

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We investigated the effects of objective knowledge and information cues on consumer financial decisions, and examined the moderating effects of field dependence–independence on the decision-making process. Participants were grouped into 2 clusters, that is, field dependent or independent cognition, according to their scores on the Embedded Figures Test (EFT). We then examined how intrinsic objective knowledge and extrinsic information cues were calibrated from an investor's cognitive ability. Results indicated that field independent participants with higher, vs. lower, scores on the EFT showed considerable superiority in acquiring information and were more risk averse. Participants with greater objective knowledge levels and prior domain expertise were also more assertive and risk prone in financial decision making than those with less objective knowledge and domain experience.

Keywords: field dependence, field independence, consumers, objective knowledge, financial decision making, risk taking, cognitive style, information cues, Embedded Figures Test.

In an increasing number of studies on consumer financial decision making, researchers have taken a multidisciplinary approach (Bateman et al., 2015; Dohmen, Falk, Huffman, & Sunde, 2010; Lusardi & Mitchell, 2014) to finance, psychology, marketing, and economics, and have revealed the rational and irrational behavior and decision-making rules of investors and consumers in financial markets (Choi, Kariv, Müller, & Silverman, 2014). It can be

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challenging to educate consumers and, in particular, to provide them with appropriate information to make financial decisions. Vague, ambiguous, and fraudulent financial reports are potentially harmful to users, and may cause materially misleading financial statements (Elliott & Willingham, 1980). Although consumers may prefer specific methods of acquiring and processing information, many lack the financial literacy to adequately evaluate financial products (Lusardi & Mitchell, 2014).

Consumer behavioral researchers (Alba & Hutchinson, 2000; Lusardi & Mitchell, 2014) maintain that consumer investors gain little profit if their objective level of knowledge is not enhanced and if the capabilities of knowledgeable consumers at various analytical levels are overlooked. Investigation of individual differences in decision making has led to styles of thinking being termed *cognitive ability* or *cognitive style*. Researchers have shown that higher cognitive ability is associated with better labor market outcomes (Bowles, Gintis, & Osborne, 2001; Cawley, Heckman, & Vytlacil, 2001; Heckman, 2006). However, in the context of conventional economic models and applications, cognitive ability is typically assumed to be independent of risk aversion in financial decision making. In contrast, in their field experiment of approximately 1,000 German adults who took a widely used intelligence quotient test as a measure of cognitive ability, Dohmen et al. (2010) found that lower cognitive ability was associated with greater risk aversion.

To extend previous research findings on investors' cognitive style, we also tested if *risk aversion* in financial decision making is related to cognitive ability. Investors encounter abundant information to read and analyze; thus, both an objective level of knowledge and the subjective cognitive ability of knowing the truth are involved in the financial decision-making process. Although macroeconomic conditions have been found to be affected by the external economic environment, individual heterogeneity in consumers' perceived value (Heckman, 2006; Maital, Filer, & Simon, 1986) plays an essential role in blending instinct with analysis in personal financial decision making. Taleb (2007) explained that some life events are outliers that cannot be predicted by rule of thumb and that after being provided with new and updated information, some people deny what they originally believed. Taleb called an extreme case in which the possibility of infrequent events is disregarded, owing to an inaccurate mental model of the uncertain environment, the *black swan effect*.

Rudell (1979) showed that effects on the consumer, rather than the nature of information, affect consumer choices. Cognitive style is placed at the interface between personality and cognition, and is a function of an individual's interaction with the environment (Bettman & Park, 1980; Brucks, 1985; Park & Lessig, 1981; Park, Mothersbaugh, & Feick, 1994). Specifically, it refers to consumers' assessment of their knowledge or the metacognitive feeling of knowing (Alba

& Hutchinson, 1987). Further, cognitive style is used in cognitive psychology to describe the process of thinking, perception, memory, and application of knowledge in solving problems. This style also relates to the characteristic, self-consistent mode of functioning that individuals show in their perceptual and intellectual activities (Heckman, 2006; Witkin, Oltman, Raskin, & Karp, 1971).

Many behavioral characteristics of consumers remain to be identified. Among other measures, one cognitive style, *field independence–dependence*, has been found to be related to analysis and intuition in problem solving and decision making (Henderson & Nutt, 1980; Hunt, Krzystofiak, Meindl, & Yousry, 1989). Individuals categorized as analytic or *field independent* (FID) focus on details and prefer to deconstruct a whole into its component parts. In contrast, intuitive or *field dependent* (FD) individuals prefer to comprehend the field as an integrated whole, and adopt a global approach to problem solving and decision making (Witkin et al., 1971). Field independence has been attributed more to men than to women (Mitchell & Walsh, 2004); however, the results of studies on gender differences have been inconsistent, with some supporting the social stereotype of women being more intuitive than men (Agor, 1986; Booth, Cardona-Sosa, & Nolen, 2014), whereas others have found the opposite (Borghans, Heckman, Golsteyn, & Meijers, 2009; Kirton, 1989). FD people tend to seek information from others to help structure situations that are not clearly defined, and require external guidance (Witkin et al., 1971). By contrast, FID people show greater autonomy in social situations, prefer to avoid vague information, and like to be organized when facing complex and uncertain situations.

In this study, we focused on the relationship between the subjective and objective mental activities that lead consumers to decisions based on information provided in financial reports. Our aim was to demonstrate how investors and professional agents in Taiwan make financial investment decisions, using a representative sample. For this purpose, we identified three major factors affecting consumer financial decision making to represent the different decision scenarios: objective knowledge, cognitive style, and information cues.

In the field of epistemology, Popper (1972) introduced a model of three worlds of knowledge: physical, subjective, and objective. Although these worlds interact with one other, *objective knowledge* represents undisputed facts about the nature of reality, such as the date when a financial crisis occurred. That is, objective knowledge is considered to be synonymous with factual or certain information. Further, objective knowledge is strongly related to ability or expertise, whereas subjective knowledge is related to consumer confidence (Alba & Hutchinson, 1987; Lusardi & Mitchell, 2014; Park et al., 1994; Radecki & Jaccard, 1995). Thus, we conducted experiments to determine how these factors affect consumer financial decisions.

Method

Participants and Procedure

Participants were 504 employees and customers (M_{age} = 36.18 years, SD = 6.20) at a financial holding company in Taiwan, who were active in investing in stocks and mutual funds. All participants were active real investors and professional agents who had invested in stocks or mutual funds for over 3 years, and they took part in this study on a voluntary basis. We distributed 504 survey forms, and collected data from March 20 to April 15, 2014. We received 430 (85.3%) valid responses, 160 of which were from women (37.3%) and 270 from men (62.7%).

Design

We designed two experiments, each with different content and numerical information (see Table 1). Participants were asked to join only one experiment, in which they read information about two funds (A = low-risk, B = high-risk) that included a description and numerical data (i.e., return rates and the financial index).

Table 1. *Differences Between the Two Questionnaires*

	Experiment 1	Experiment 2
Volatility	✓	✓
Beta	✓	–
Sharp ratio	✓	–
Cumulative return	3 months, 6 months, 1 year, 2 years, 3 years, 5 years, 10 years	1 year, 2 years, 3 years
Years of return	2004–2013	2009–2013
Trend of net value	The past 48 months	The past 12 months

We adopted a factorial experimental design using questionnaires to collect data. To balance the number of participants, we randomly assigned them to either Experiment 1 or 2. Identical financial information was included in a hypothetical mutual fund description, and 212 participants read the version with low numerical content, whereas the remaining 218 read the version with high numerical content before making an investment decision within 10 minutes. We referred to Hadar, Sood, and Fox's (2013) experimental design to help consumers make asset allocation decisions, because it was shown to have good validity. This allowed us to observe how the decision-making process was affected by the information cues embedded in the two experiments. Each participant was given NT$100,000 (about US$3,100) to purchase 20 units in a hypothetical fund, and the capital could either be allocated between the two funds or fully invested in

one fund. Participants were asked to discuss the dilemma in their own words and then make a decision. In this design, the financial decisions for the high-risk commodities, namely the B fund, were a dependent variable.

In addition, we investigated objective financial knowledge as it relates to consumer behavior in financial investments (including the investment period and preference for financial instruments) by using the Taiwanese Securities and Futures Institute Test (2012). Finally, to determine participants' cognitive style we used the Embedded Figures Test (EFT; Witkin et al., 1971), in which participants must locate a previously seen simple figure that is embedded in a larger and more complex image designed to obscure the simple figure. FID people can quickly find the hidden figure, whereas FD people have trouble with this task (Mitchell & Walsh, 2004; Witkin et al., 1971).

Data Analysis

We used analysis of variance (ANOVA) to compare the simultaneous interaction among three major factors affecting consumer financial decision making: objective knowledge, cognitive style, and information cues. In the Phase 1 model, we investigated how the cognitive style of field dependence–independence affected consumers' decision making when they were dealing with different numerical information. We used the EFT in advance to categorize participants as FD (lower 50% of scores) or FID (upper 50% of scores). As people might refer to objective knowledge to make improved choices, an objective knowledge variable was added in the Phase 2 model. Participants were categorized as having high or low objective knowledge by using an official certification of the score rating on the Securities and Futures Institute test. We used SAS for Windows version 9.3 for statistical analyses.

Results

Financial Decisions According to Numerical Information Content

The ANOVA results for the Phase 1 model revealed a significant interaction effect ($p = .013$) between numerical information content and field dependence–independence cognitive style when participants were making risky financial decisions, but the information content was not statistically significant ($p > .05$; see Table 2). We then added the objective knowledge variable to the full Phase 2 model, which reached significance ($p = .033$). In addition, there remained a significant interaction effect between information cues and cognitive style ($p = .027$). There was also no significant difference between the two groups when participants were examining different numerical information content to select either the low- or high-risk fund ($p > .05$; see Table 3).

Analysis of Objective Knowledge Effect

There was a significant main effect of objective knowledge (p = .025), but there was no significant interaction between objective knowledge and the other factors ($p > .05$; see Table 3). Results showed that when investors made financial decisions, objective knowledge played a critical role in the decision process. Participants with higher objective knowledge and prior *domain expertise*, which is obtained by amassing and analyzing objective facts, were more assertive and risk prone. In other words, investors with greater objective knowledge were more confident about their financial decisions, especially in regard to choosing high-risk financial commodities.

Moderating Effects of Field Dependence–Independence Cognition on Financial Decision Making

We performed further analysis on the influence of the interaction effect between the numerical information content and field dependence–independence cognitive style when participants were making risky financial decisions. Results showed that the tendency to avoid risky decision making in Experiment 2 groups with low numerical content was more significant ($p < .001$) in FID participants ($M_{\text{risky B fund}} = 10.92$) than in FD participants ($M_{\text{risky B fund}} = 13.78$). By contrast, we found no significant interaction effect between the numerical information content and field dependence–independence cognitive style when participants were making a risky financial decision in Experiment 1 groups with high numerical content ($p > .05$). Results also showed that cognitive style did not have a direct effect on financial decision making but, rather, affected it though the reading of numerical information content (see Table 3). Finally, there was no significant interaction between objective knowledge and field dependence–independence cognition ($p > .05$; see Table 3).

Table 2. *ANOVA Results for the Phase 1 Model*

Source	F	$p > F$	R^2	B fund M
Model	2.28	.062*	.042	12.107
Numeric information	0.11	.742		
Cognitive style	1.03	.310		
Numeric information × Cognitive style	6.33	.013**		

Note. * $p < .10$, ** $p < .05$.

Table 3. *ANOVA Results for the Phase 2 Model*

Source	F	$p > F$	R^2	B fund M
Model	2.15	.033**	.077	12.107
Numeric information	0.05	.822		
Cognitive style	1.21	.272		
Numeric information × Cognitive style	4.94	.027**		
Objective knowledge	5.08	.025**		
Objective knowledge × Numeric information	0.12	.726		
Objective knowledge × Cognitive style	0.20	.655		
Objective knowledge × Numeric information × Cognitive style	0.08	.775		

Note. * $p < .10$, ** $p < .05$.

Discussion

We examined the three types of factors that may influence a consumer's judgment in a hypothetical risky financial decision. Unlike previous researchers (Alba & Hutchinson, 1987; Park et al., 1994), who focused on identifying subjective knowledge principles based on normative philosophical and cultural perspectives, or evaluating whether risk aversion and impatience are correlated with cognitive ability, we explored the relationship between objective knowledge and field dependence–independence cognitive style by empirically testing the applicability of the EFT. Specifically, we investigated the effect of objective knowledge and information cues on consumer financial decisions, in order to clarify the moderating role of cognitive style. Our results showed that FID investors with high scores on the EFT were more sensitive to complicated numerical information than were FD investors, but that level of objective knowledge did not have a significant impact on the ability of the former group to process information. We also found that FID investors showed high autonomy and capability in processing information in information-poor situations. Conversely, FD investors with a preference for the high-risk fund relied on more external information to make deliberate choices. In other words, in nonstructured situations or when there was no reason to believe that there was a useful source of information to resolve ambiguity, FD and FID people differed in their response to external social referents; thus, the amount of information cues only affected people with the FID cognitive style.

The results of Dohmen et al. (2010) suggest that financial reports or contracts should be related to observable proxies for cognitive ability, so that individuals are selected on the basis of willingness to take risks—a trait that is of crucial interest to employers or insurance companies. According to our results, the amount of available numerical information cues had a difference influence

on the performance of FD and FID individuals. We suggest that there are still many behavioral finance concerns to be examined, each with a supporting psychological theory. Therefore, it is appropriate to discuss behavioral finance using different psychological constructs, such as alternative important cognitive styles, with participants not measured by an intelligence quotient test or the EFT, to lend further support to the literature on financial decision-making implications. Because of the limitations of using only a convenience sample, we also suggest that in the future, a population-based study be conducted to increase the generalizability of our findings.

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