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An Investigation of Psychological Factors Influencing Investment Decision Making

Hsin-Hue Chang *

This study applies a second-order confirmatory factor analysis (CFA) approach to investigate psychological factors influencing individuals' investment decision-making. A second-order CFA approach consists of five first-order psychological factors in terms of mental accounting, regret avoidance, self-control, heuristic and overconfidence, and one second-order factor in terms of investment decision-making. Quantitative data was yielded by the questionnaire, and an effective sample of 752 responses was used to execute the estimation procedure. The results reveal that there exist statistically significant relationships between five psychological factors and investment decision-making. Investors are likely to consider a product with different functions as one with different mental accounts (gains). Thus, financial institutions are advised to provide their potential customers with multi-function products. Since self-control is a significant self-imposed mechanism for investment decision-making, financial institutions can merchandise products that can help their customers to execute the self-imposed rules of thumb.

Keywords: *mental accounting, regret avoidance, overconfidence, investment decision-making, confirmatory factor analysis.*

Introduction

Although suggesting investors is rational, efficient market theory could not interpret the irrational phenomena in the financial markets such as disposition effect, overreaction. Disposition effect means that investors tend to sell winners too early and hold on to losers too long (Shefrin and Statman, 1985), and overreaction means that investors overreact to the market information and have the tendency to buy high and sell low (Barberis, Shleifer and Vinsny, 1998; Daniel, Hirshleifer and Subrahmanyam, 1998; De Bond and Thaler, 1985; Odean, 1998).[1] Since 1980s behavioral finance has employed psychological factors to account for the cognitive biases guiding investors to make irrational decisions. A great number of behavioral finance studies have used investors' transaction accounts

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[1] Barberis, Shleifer and Vinsny (1998) and Daniel, Hirshleifer and Subrahmanyam (1998) also argue that investors underreact to the market information.

(Barber, et al., 2007; Odean, 1998; Shefrin and Statman, 1985) or experimental data (Weber and Camerer, 1998; Wong, et al., 2006) to test the disposition effect. And, not few studies use the market data to examine whether investors overreact to the market information (De Bond and Thaler, 1985; Dreman and Lufkin, 2000; Odean, 1999). Most of the studies suggest that there exist cognitive biases in the financial markets and indicate that psychological factors significantly affect individuals' investment decision-making.

Previous studies, in general, use empirical results or experimental findings (e.g., disposition effect, overreaction) to infer hidden causes (i.e., psychological factors) (Dreman and Lufkin, 2000; Wong, et al., 2006). However, the irrational phenomena might result in investors' financial budget or other nonpsychological factors such as the mean reversion theory (Wong, et al., 2006).[2] It is necessary to ask investors directly if psychological factors influence their investment decisions. This study, thus, adopts the questionnaire to yield the quantitative data, and further applies a confirmatory factor analysis (CFA) approach to confirm the psychological factors influencing individuals' investment decision-making.

Not few marketing researches adopt a CFA approach to investigate factors influencing customers' satisfaction or loyalty (Al-Hawari, et al., 2005; Chang, et al., 2004; Olorunniwo, et al., 2006). Furthermore, when factors have high correlations with a higher factor, a second-order CFA approach is more appropriate for executing the estimation procedure than a first-order CFA (Chang, et al., 2004). Investors' decision-making can be considered as a conceptual construct like customers' satisfaction or loyalty. According to behavioral finance theory, psychological factors have high correlations with investors' decision-making, this study, thus, employs a second-order CFA approach to conduct the empirical analysis. To the best of my knowledge, few studies to date adopt a second-order CFA approach to examine psychological factors that affect investor's decision-making.

The main purpose of this study is to use the questionnaire data to confirm the relationship between investor's decision-making and psychological factors. Referred to behavioral finance literature, five psychological factors, in terms of mental accounting, regret avoidance, self-control, heuristic and overconfidence, are employed to execute the analysis. The empirical findings reveal that investors are influenced by the five psychological factors proposed. Consequently, an investors' behavioral decision-making model can be suggested. In addition, according to the results, this study provides some strategic implications that might help investors and financial institutions to make their investment decision and marketing, respectively.

The study is organized as follows: section 2 reviews the theoretical background, section 3 outlines the methodology, section 4 presents the data employed and the empirical results, and section 5 offers concluding remarks and strategy implications.

Literature Review

Most of the studies of disposition effect indicate that investors have the tendency to sell winners too early and ride losers too long. Generally, the studies employ *mental accounting* (Barber, et al., 2007; Frazzini, 2006; Shefrin and Statman, 1985; Thaler, 1985), *regret avoidance* (Fogel and Berry,

[2] The mean reversion theory states that investors buy low and sell high in the belief that investment asset prices would revert back to the average level.

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2006; Shefrin and Statman, 1985; Wong, et al., 2006), and/or *self-control* (Chui, 2001; Shefrin and Thaler, 1981; Shefrin and Statman, 1985) to interpret the disposition effect. Besides, not few studies examine if investors overreact to a series of good or bad news, and use *heuristic* (Barberis, et al., 1998) and/or *overconfidence* (Barber and Odean, 1999; Daniel, et al., 1998) to account for the irrational phenomenon in the financial markets.

Mental accounting

Mental accounting describes the psychological creation of separate accounts or budgets for categories of decisions. Basically, it has the same concept with prospect theory developed by Kahneman and Tversky (1979),[3] which implies that individuals consider gains and losses as different mental accounts (Shefrin and Statman, 1985; Thaler, 1985; Frazzini, 2006). In addition, based on the S-shape valuation function of prospect theory, Thaler (1985) indicates that investors prefer the segregation (integration) when facing the multiple gains (losses) and integration (segregation) when facing the mixed gain (losses).

Though deconstructing complex budget or investment problem into small, local decisions can provide cognitive simplicity, the use of mental accounts can lead to the decision bias (Thaler, 1985). For a budget example, individuals often simultaneously borrow a car loan and make deposits for children's education funds, while the loan rate is higher than the deposit rate. It is an obvious decision bias. Not few behavioral finance studies use mental accounting as the reason that investors have the disposition effect. For example, Shefrin and Statman (1985) indicate that investors place winning stocks and losing stocks into different accounts and resist the realization of the losing stocks because of hurting their pride. Barber, et al. (2007) find that eighty-four percent of all Taiwanese investors sell the winning stocks at a faster rate than the losing stocks because of mental accounting. This implies that mental accounting is a significant factor that influences investors' decision-making.

Regret avoidance

Regret is commonly defined as a negative emotion evoked by the knowledge that a different choice would have generated a preferred outcome. The emotion of regret consists of an evaluation of the realized outcome compared to some alternatives, and a feeling of self-blame for having a bad choice (Connolly and Zeelenberg, 2002). The degree of regret is correlated with the "closeness" of the foregone or counterfactual alternative. Fogel and Berry (2006) indicate an investor who comes close to selling a losing stock but continues to hold on to it will experience more regret than that who considers the same trade only. Another aspect of regret is whether outcomes are obtained through acts of omission or commission. Omission means not performing an act that is usually done or expected to be performed by a normal person, while commission means performing an act that results in some harm or losses. Individuals feel more regret for actions that led to a bad outcome than that for bad outcomes that occurred from failing to act (Fogel and Berry, 2006; Ritov and Baron, 1995).

[3] The prospect theory of Kahneman and Tversky (1979) states that individuals make their choices through editing and valuation phases when facing an uncertain game. In the editing phase, individuals edit (or frame) their choices in terms of potential gains and losses, related to a reference point. In the evaluation phase, individuals use an S-shaped valuation function which is concave in the gains region (risk-aversion) and convex in the losses region (risk-seeking) to represent their risk attitude. This implies that individuals consider gains and losses as different mental accounts.

Although the emotion of regret can only be experienced after the fact, it can be anticipated before an act. Thus, not few behavioral finance studies frequently use regret avoidance as a factor to interpret the disposition effect. Most of the studies suggest that investors regret holding on to the winning stock now if the stock price declines tomorrow and selling the losing stock now if the stock price increases tomorrow (Barber and Odean, 1999; Garvey and Murphy, 2004; Odean, 1998; Shefrin and Statman, 1985; Wong, et al., 2006). For avoiding the emotion of regret, investors have the tendency to sell winners too early and ride losers too long (Fogel and Berry, 2006; Shefrin and Statman, 1985).

Self-control

Investors are a farsighted planner and a myopic doer and reveal intrapersonal conflicts when making decisions. To prevent from adopting a myopic behavior, the investors can use psychological techniques to mitigate the intrapersonal conflicts between the part of doer and the part of planner. Shefrin and Thaler (1981) indicate that investors can apply the techniques of directly modifying the doer's preferences and the methods of explicitly monitoring the doer's behaviors. In addition, they suggest investors can adopt self-imposed rules of thumb that limit the range of doer discretion if the monitor costs are high.

Disposition effect is considered a self-control problem (Chiu, 2001; Shefrin and Statman, 1985; Wong, et al., 2006). The part of emotional doer is related to the emotions of regret and pride. Investors hold on to the losing stocks for deferring the emotion of regret and realize the winning stocks quickly for hastening the feeling of pride. However, the part of rational planner may not be strong enough to stop the part of emotional doer from interfering with rational decision making. Thus, investors can employ the self-imposed rules of thumb to minimize the doer's resistance to realizing losses. For example, investors can use automatic rules and devices to force the realization of a loss once it has reached a predetermined loss level such as the stop-loss order (Shefrin and Statman, 1985; Wong, et al., 2006).

Heuristic

Heuristic is a principle or a method by which a judgment can be made easily. Though heuristic is often very useful, sometimes it can lead to systematic errors (Tversky and Kahneman, 1982). Basically, heuristic that underlies many intuitive judgments under uncertainty consists of representativeness, anchoring, affect. Representativeness means that an event is judged to be probable to the extent that it represents the essential features of its generating process (Kahneman and Frederick, 2002). Barberis, et al. (1998) indicate investors believe they see patterns in truly random sequences and overreact to the market information. In other words, investors use representativeness heuristic to execute their investment decision-making.

Anchoring is the tendency depending too heavily on a piece of past information when investors make decisions.[4] Although investors should adjust their belief in light of new information, anchoring makes the adjustment is insufficient and can lead to mistakes (Chapman and Johnson, 2002). In addition, affect means the specific quality of "goodness" or "badness" experienced as a feeling state. The reliance on such a feeling can be described as the affect heuristic (Slovic, et al., 2002). Not few

[4] Anchoring is similar to conservatism, which means the slow updating of models in the face of new evidence. Barberis, et al. (1998) use conservatism to interpret the underreaction phenomenon in the financial markets.

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studies investigate if a great company is a great investment (Anderson and Smith, 2006; Anginer, et al., 2007; Antunovich, et al., 2000). This implies investors consider great companies as affect heuristic to judge whether to invest them or not.

Overconfidence

Psychologists regard one as overconfident when he believes his ability is better than he really is. Many experimental studies have investigated whether subjects are overconfident (Pallier, et al., 2002; Menkhoff, et al., 2006). Subjects are briefly asked to answer factual questions in a variety of subject domain and/or predict the outcome of a forthcoming event. Researchers, then, compare the actual rate at which subjects are correct with their predictions of being correct. Most of the results find that subjects overestimate their accuracy in answering questions and reveal the tendency of overconfidence. Generally speaking, individuals with higher degree of perceived expertise in the area of a general knowledge are likely to have higher expectation of the probability of answering correctly (Bradley, 1981). However, Törngren and Montgomery (2004) indicate professionals have the tendency of desirability bias and tend to overestimate probabilities of preferred outcomes and underestimate undesired outcomes.

Not few behavioral finance studies have examined whether investors are influenced by overconfidence when making their investment decisions. For example, Allen and Evans (2005) examine the extent to which trader overconfidence exists in the financial markets. Results reveal that approximately 40% of respondents exhibited overconfidence. The studies of Barber and Odean (1999) and Daniel, et al. (1998) indicate overconfident investors have the tendency to overreact the market information. Törngren and Montgomery (2004) state that overconfidence influences both professionals and laypersons, and higher confidence judgments do not reflect more correct predictions for either professionals or laypersons in the stock market.

Methodology

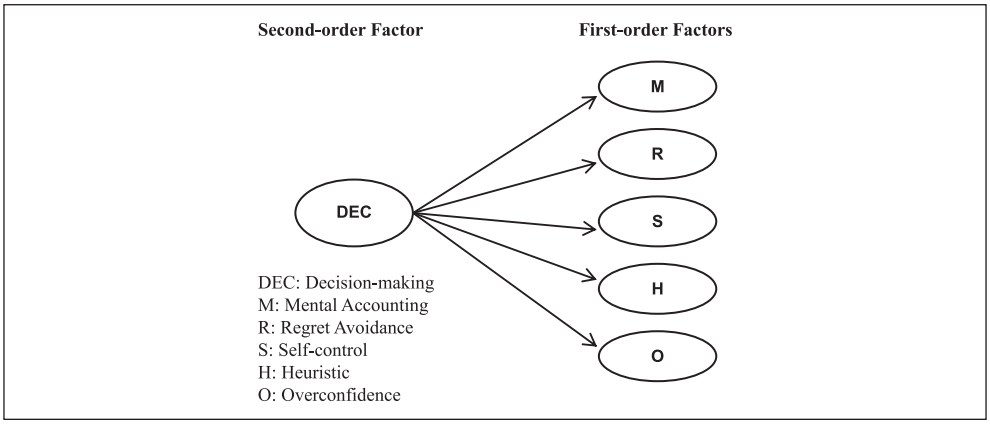
Conceptual framework

A second-order of confirmatory factor analysis (CFA) is frequently used to investigate the factors influence customers' satisfaction in marketing literature. For example, Chang, et al. (2004) use four first-order factors, in terms of shopping convenience, Internet ecology, customer relation and product value, to investigate if they influence the second-order factor of customers' satisfaction with online shopping. Following the study of Chang, et al. (2004), it is plausible to employ a second-order CFA approach to examine the psychological factors influencing investment decision-making. By reviewing the relevant psychological factors associated with behavioral finance literature, this study briefly employs five first-order factors including mental accounting, regret avoidance, self-control, heuristic and overconfidence to investigate if they affect the second-order factor of individuals' investment decision-making. As a result, the conceptual framework is shown in Figure 1.

The empirical setup of confirmatory factor analysis

A second-order confirmatory factor analysis (CFA) approach involves re-examining the specification and estimation of models by providing a set of factor constructs to account for covariances among a set of observed variables (Al-Hawari, et al., 2005; Chang, et al., 2004).

Figure 1. The Conceptual Model of Investment Decision-Making



A second-order CFA approach is presented as follows:

$$y = \Lambda_y \eta + \varepsilon \quad (1)$$

$$\eta = \Gamma \xi + \zeta \quad (2)$$

$$y = \Lambda_y(\Gamma \xi + \zeta) + \varepsilon \quad (3)$$

where $y'=(y_1,y_2,...y_p)$ is a p x1 vector of observed variables, and is the number of question items. $\eta' = (\eta_1,\eta_2,...,\eta_m)$ is a mx1 vector of first-order factors, in which m=5, including mental accounting, regret avoidance, self-control, heuristic and overconfidence. Therefore, Λ_y is a px5 matrix of factor loadings of y on η, and ε is a px1 vector of observed error in y. $\xi'=(\xi 1,\xi 2,...,\xi n)$ is a nx1 vector of second-order factors, in which n=1, representing investment decision-making. Γ denotes a 5×1 matrix of coefficients of η on ξ, and ζ represents a 5×1 vector of second-order unique component. It assumes that $E(\zeta)=0$, $E(\varepsilon)=0$, and ε is uncorrelated with ζ. In addition, the covariance matrix is presented as follows:

$$\Sigma=\Lambda_y(\Gamma\Phi\Gamma'+\Psi)\,\Lambda'_y+\Theta_\varepsilon \quad (4)$$

where Φ is the covariance matrix of ξ, Ψ is the covariance matrix of ζ, and Θ_ε is the covariance of ε, a diagonal matrix.

Data

This study employed the questionnaire to yield the quantitative data. Questionnaire consisted of two parts, question items designed for five psychological factors and demographic questions. The question items were identified through a comprehensive review of behavioral finance literature. In addition, the pretest was executed by a behavioral finance professor and two senior managers of securities firms. The sample items questionnaire is shown in Table 1. A seven-point Likert-type scale was used, with a range from one (strongly disagree) to seven (strongly agree). Questionnaires were executed through one securities firm with branches in the whole Taiwan in December 2008. Respondents with investment experience were asked to answer the relevant questions. This study distributed 1,018 questionnaire surveys and received 792 responses. A final effective sample of 752 responses was adopted.

The questionnaire asked respondents to answer demographic questions including gender, age, marital status, education and income. The demographic characteristics of the sample are summarized in Table 2. The demographic profile reveals that the sample of 752 respondents is primarily in the female (55.7%), married (53.3%), the age

Table 1. Sample Items Questionnaire

Factor	Sample item
Mental Accounting (6)[1]	If I have two stocks, one loses NT$ 15 and the other loses NT$ 5, I feel a total loss of NT$ 20.
Regret Avoidance (4)	I regret selling the winning stocks too soon.
Self-control (6)	I can set a stop-loss order with a proper price.
Heuristic (5)	I think a great company is a great investment.
Overconfidence (6)	I believe I can beat the market.

[1] the number of question items is presented in parentheses

Table 2. Demographic Profile of The Respondents

Demographic characteristics		Frequency	Percentage
Gender	Male	333	44.3%
	Female	419	55.7%
Age	under 25 years old	86	11.4%
	26~40 years old	385	51.2%
	41~55 years old	240	31.9%
	over 56 years old	41	5.5%
Marital Status	Yes	401	53.3%
	No	351	46.7%
Education	junior high school	13	1.7%
	senior high school	148	19.7%
	collage & university	490	65.2%
	graduate school	101	13.2%
Income	under 360 thousand NT Dollars	175	23.3%
	361~600 thousand NT Dollars	309	41.1%
	601~900 thousand NT Dollars	157	20.9%
	901~1200 thousand NT Dollars	73	9.7%
	over 1201 thousand NT Dollars	38	5.1%

of 26~40 (51.2%), highly educated (78.4%), and the income of 361~600 thousand NT Dollars (41.1%). Following the prevalence of individual investment in Taiwan, the young people are active in stock investment. Thus, the sample that younger investors take the major part is acceptable. Highly educated sample takes the significant part, which reveals that the respondents of the sample have enough judgment to express their opinions. In addition, Taiwanese per capita income is about 500 thousand NT Dollars, and most of respondents are in the age of 26~40 and the income of 361~600 thousand NT Dollars.[5] This reveals the sample is a representative dataset of population.

Result and Discussion

Model-data fit

A sample of 752 respondents was used with a second-order confirmatory factor analysis approach to examine the proposed model. An interactive process of specification search is followed to refine the measures. The final test result for the proposed model is shown in Figure 2, and the model-data fit are reported in Table 3. To examine the model-data fit, some fit indices are used to indicate the extent to which the data can be represented by the proposed model. The chi-squared statistics is a common test of model's ability to

[5] The exchange rate of US Dollar to N. T. Dollar is about 32.

Figure 2. A Second-Order CFA Model for Investment Decision-Making

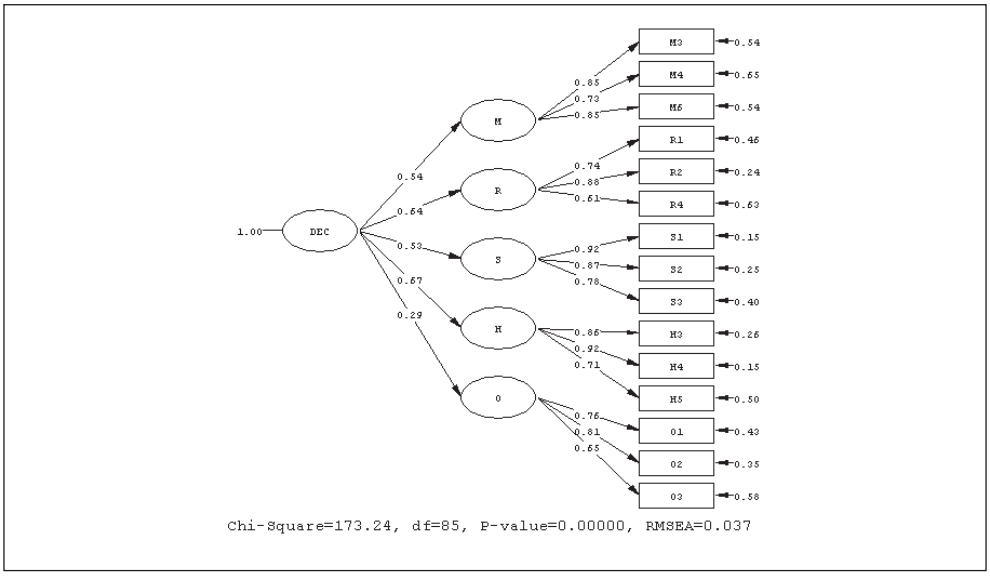


Table 3. Goodness of Fit Indices For Investment Decision-Making Model

Model-data fit	Indices	Statistics	Threshold
Absolute fit indices	$\chi 2$/d.f.	173.24/85=1.86	<3
	RMSEA	0.037	<0.85
	GFI	0.94	>0.9
Incremental fit indices	AGFI	0.92	>0.9
	NFI	0.95	>0.9
	NNFI	0.96	>0.9
	CFI	0.94	>0.9
	RFI	0.96	>0.9
	IFI	0.96	>0.9
Parsimonious fit indices	PGFI	0.67	>0.5
	PNFI	0.77	>0.5
	CN	263.19	>200

reproduce the sample variance/covariance matrix. Since its significant level is sensitive to sample size, the chi-squared statistic must be interpreted with caution in most applications (Joreskog and Sorborn, 1989).

In general, absolute indices of goodness-of-fit such as chi-square divided by the degree of freedom ($\chi^2/d.f.$), goodness-of-fit index (GFI), root mean square residual error of approximation (RMSEA) are used to evaluate the proposed model. Moreover, incremental fit indices and parsimonious fit indices are referred to assess the proposed model. Incremental fit indices include AGFI (Adjusted Goodness of Fit), NFI (Normed Fit Index), NNFI (non-Normed Fit Index), CFI (Comparative Fit Index), IFI (Incremental Fit Index) and RFI (Relative Fit Index). Parsimonious fit indices include PGFI (Parsimonious Goodness Fit Index), PNFI (Parsimonious Goodness Fit Index), and CN (Critical N).[6]

[6] With regard to the measurements and meanings of indices, see Joreskog and Sorborn (1989).

Table 4. Test Results of Validity and Reliability

Latent variables	Observed Variables	Factor loading (t-value)	AVE	CR
Mental Accounting	M3: two losses (integration preferred)	0.85 (--)[1]	0.53	0.77
	M4: two gains (segregation preferred)	0.73 (10.01***)		
	M6: a big gain and a small loss (integration preferred)	0.85 (12.29***)		
Regret Avoidance	R1: the regret of selling winners	0.74 (--)	0.56	0.79
	R2: the regret of holding losers	0.87 (15.50***)		
	R4: the more regret of holding losers than winners.	0.61 (11.77***)		
Self-control	S1: setting a stop loss order	0.92 (--)	0.73	0.89
	S2: setting a stop gain order	0.87 (23.53***)		
	S3: executing a stop loss strategy	0.78 (14.43***)		
Heuristic	H3: great companies and great investments	0.86 (--)	0.70	0.87
	H4: admired companies and admired returns	0.92 (23.77***)		
	H5: good companies and good performances	0.71 (18.44***)		
Overconfidence	O1: beating the market	0.76 (--)	0.63	0.78
	O2: making good money on investment	0.81 (14.65***)		
	O3: doing a good investment	0.65 (12.45***)		

[1] Since the first observed variable of each factor is used to standardize the other factor loadings in the same factor, its t-value does not exist.
*** significance at 1% level

The value of the chi-squared statistic divided by the degree of freedom is 1.86, which is less than the threshold value of 3. In addition, the value of RMSEA is 0.037, less than the threshold value of 0.85. Furthermore, referring to the other fit statistics, all indices (GFI=0.94, AGFI=0.92, NFI=0.95, NNFI=0.96, CFI=0.94, RFI=0.96, IFI=0.96, PGFI=0.67, PNNFI=0.77, CN=263.19) are above a common threshold value. Therefore, the estimated model is approved.

Validity and Reliability

Validity and reliability tests are important to standardize the measurement scales. Convergent validity is assessed by reviewing the t-tests for the factor loadings, which are used to assess if observed variables are sufficient in representing their respective factor constructs (Anderson and Gerbing, 1988; Raine-Eudy, 2000). The results reveal each factor loading of the construct factors shows highly significant t-statistics, shown in Table 4. This implies that all observed variables provide good measures to their respective factor construct in the proposed model.

Average variance extracted (AVE) and composite reliability (CR) are used to measure the construct reliability. AVE evaluates the amount of variance captured by the construct. Therefore, AVE that is larger than 0.5 indicates the measurement error is less than the variance captured by the construct (Bagozzi and Yi, 1998). CR is similar to Cronbach alpha, and reflects the internal consistency of the indicators measuring each construct. The results reveal that all the AVE values are over the recommended value of 0.5, and all the values of CR are over common threshold of 0.7, shown in Table 4.

In addition, discriminant validity measures the extent to which the constructs are different. The average AVE of the two constructs must exceed the square of their correlation to satisfy the test (Al-Hawari, et al., 2005). The average AVE and the squared correlation for every possible pair of constructs are calculated and shown in Table 5. The results reveal that all average AVE for each pair of factor constructs is larger than the squared correlation for the same pair, indicating that each construct is distinct.

Table 5. Results of Uni-Dimensionality Analysis

	M	R	S	H	O
Mental Accounting		0.59[1]	0.61	0.56	0.56
Regret Avoidance	0.18		0.66	0.61	0.60
Self-control	0.13	0.34		0.63	0.62
Heuristic	0.20	0.18	0.12		0.57
Overconfidence	0.04	0.15	0.02	0.04	

[1]The upper level denotes the average AVE while the lower lever denotes the squared correlations for every pair.

Furthermore, observing the question items of each factor, the results reveal that the factor of mental accounting consists of M3 (preferring the integration of two losses), M4 (preferring the segregation of two gains), and M6 (preferring the integration of a big gain and a small loss). Based on S-shape valuation function of prospect theory, investors prefer the segregation (integration) when facing two gains (losses) and the integration when facing a large gain and a small loss (Thaler, 1985). This implies that investors consider gains and losses as different accounts and use mental accounting to make their investment decisions. The factor of regret avoidance consists of R1 (the regret of selling winners), R2 (the regret of holding losers) and R4 (the more regret of holding losers than winners). This indicates that the emotion of regret avoidance always torments with investors. In addition, the factor of self-control consists of S1 (setting a stop loss order), S2 (setting a stop gain order) and S3 (executing a stop loss strategy). This shows that investors employ the self-imposed rules of thumb to minimize the resistance to realizing losses. Moreover, the factor of heuristic consists of H3 (great companies and great investments), H4 (admired companies and admired returns), and H5 (good companies and good performances). This implies that investors mainly use affect heuristic to execute investment decisions. Finally, the factor of overconfident consists of O1 (beating the market), O2 (making good money on investment), and O3 (doing a good investment). These items reveal that investors are more or less overconfident for their investment decisions.

Path Relationships

Path coefficients, standardized total effects of exogenous latent variables on endogenous latent variables, are used to assess whether the proposed relationships are substantiated. The empirical results are shown in Table 6. The findings reveal all path relationships are statistically significant. This implies that investors' decision-making can be measured by the psychological factors of mental accounting, regret avoidance, self-control, heuristic and overconfidence. As a result, a behavioral investment decision-making model can be proposed.

Mental accounting is related to the framing (Kahneman and Tversky, 1979; Thaler, 1985), as shown in Table 4. This implies that mental accounting makes investors have the tendency to hold the losing stocks too long and sell the winning stocks too early for avoiding losses (Barber, et al., 2007; Shefrin and Statman, 1985), Regret avoidance makes investors produce resistance to hold the winning stocks too long and sell the losing stocks too early. In addition, self-control reveals that investors use a stop-loss (stop-gain) rule can help investors to avoid holding (selling) the losing (winning) stocks too long (early). Heuristic is mainly associated with affect heuristic, which implies investors may rely on intuitions to do a stock-picking. Finally, overconfident investors believe that they can make a good investment and beat the

Table 6: Results of path relationship

Psychological factor	Path Coefficient	t-value
Mental Accounting	0.54	9.38***
Regret Avoidance	0.64	9.74***
Self-control	0.53	10.22***
Heuristic	0.67	13.58***
Over-confidence	0.29	4.47***

*** significance at 1% level

market. However, overconfidence has less effect on investment decision-making, comparing with the other four factors. This may be because the questionnaire was executed in December 2008 and the financial crisis of 2008 frustrated investors' overconfidence.

Conclusion

The aim of this study is to investigate psychological factors that influence individuals' investment decision-making. Based on behavioral financial theory, this study employs five psychological factors, in terms of mental accounting, regret avoidance, self-control, heuristic and overconfidence, to examine if those factors affecting investment decision-making. This study yields the quantitative data by the questionnaire and then applies a second-order CFA approach to execute the estimate procedure. The empirical results reveal that all the data-model fit, validity and reliability are excellent, which implies the suggested model is acceptable. Therefore, one second-order factor of investment decision-making can be measured by mental accounting, regret avoidance, self-control, heuristic and overconfidence. As a result, a sentiment model for investment decision-making can be suggested.

The empirical results reveal investors consider gains and losses as different mental accounts and use mental accounting (the framing) to make investment decisions. Accordingly, as an alternative to expected utility theory, prospect theory is a significant theoretical foundation to account for investors' behaviors. The results also show affect heuristic is a significant factor influencing investors' decisions. Investors are likely to consider a great company as a great investment. This implies they may use brand names to pick stocks. In addition, the emotions of regret avoidance and self-control are significant factors influencing investment decision-making. Regret avoidance produces resistance to hold the winning stocks too long and sell the losing stocks too early, but using self-control mechanism (a stop gain and stop loss) can control the emotion of regret avoidance. Moreover, overconfidence is an important factor affecting investment decision-making but has less effect on investment decision-making than the other four psychological factors. This may be because the financial crisis of 2008 made investors less overconfidence.

The empirical results might help investors to do investment decision-making. Previous studies indicate irrational investment decisions, such as disposition effect and overreaction, might bring investors less performance (Odean, 1998). Therefore, investors are advised to use self-imposed mechanism such as stop-loss (gain) rule to mitigate the decision bias. In addition, affect heuristic has a significant effect on investment decision-making. This implies investors tend to intuitively pick the stocks of admired companies. However, not all the previous studies suggest that the admired companies have admired performance (Anginer et al., 2007). Investors should refer to the objective financial information of the admired companies and then decide whether to invest them or not.

On the other hand, understanding the psychological factors influencing investors' decision can help financial institutions to make their marketing strategies. Since mental accounting significantly affects investors' decisions, financial institutions should provide their potential customers

with multi-function products. For example, it may be difficult to sale life insurance products because of the sentiment of death. However, if insurance companies provide life insurance products with additional functions such as saving function, it may be more easily accepted by customers. This is because investors consider life insurance and saving insurance as different mental accounts (gains) and prefer the segregation of multiple gains (Thaler, 1985). In addition, since self-control is an important self-imposed mechanism for investment decision-making, financial institutions can provide products that can help investors to execute the self-imposed rules of thumb.

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