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How Herding Bias could be derived from Individual Investor Types and Risk Tolerance?

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***Abstract*—**This paper is to clarify the relationship of individual investor types, risk tolerance and herding bias. The questionnaire survey investigation is conducted to collect 389 valid and voluntary individual investors and to examine how the risk tolerance plays as a mediator between four types of personality and herding bias. Based on featuring BB&K model and reviewing the prior literature of psychology, a linear structural model are constructed and further used to evaluate the path of herding formation through the analysis of Structural Equation Modeling (SEM). The results showed that more impetuous investors would be prone to herding bias directly, but rather exhibit higher risk tolerance. However, risk tolerance would fully mediate between the level of confidence (i.e., confident or anxious) and herding bias, but not mediate between the method of action (careful or impetuous) for individual investors.

***Keywords*—**Herding, Investor types, Risk tolerance

I. Introduction

WHEN the individual investors face with uncertainty, for benefit, they are likely to make different decisions [28] or they may follow the recommendations of professional investors or collecting the relevant information to make profit from optimal investment decisions. However, more and more empirical studies reveal their decisions and choices are not all completely rational due to the existence of investment biases [18, 43]. Therefore, behavioral finance which focuses on the individual attributes, psychological or otherwise, that shape common financial and investment practices has evolved that attempts to better understand and explain how emotions and cognitive errors influence investors and the decision-making process [39]. Some psychological research suggests that human's behavior is formed by psychological factor and external factor and indicates that investors' behavior will be affected by personality traits, interpretation of information, responses of sentiments, return and risk [16, 33]. In last two decades, psychographic models have been also designed to classify individual investors according to their characteristics, tendencies, or behavior. These academic models use various dimensions to deal with the measurements of personality traits, such as internal/external personality propose by [40]; investor types (i.e. BB&K model) proposed by [3] and Myers-Briggs type indicator (MBTI) by [35]; Big five personality traits by [11]. Psychographic classifications are especially relevant with respect to the investment strategies of individual investors and risk tolerance [36].

Especially, BB&K model features some of the principles of the Barnewall's model that specifically classify the personalities of individual investors along two axes (i.e., level of confidence and method of action) [5].

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It is useful in dealing with certain clients and explains in general terms why a person is predisposed to the behaviors of certain investors.

On the other hand, the determinants of risk attitudes of individual investors are of great interest in a growing area of finance known as behavioral finance. Most economic decisions are driven by primitive individual utility function, including particular preferences for risk [14, 48]; [1]. It is amply documented that risk is a factor that shapes individuals' decisions, including financial and investment decisions [31, 48]. Thus, understanding the factors that determine risk attitudes is imperative to understand individual investment decisions. References [7, 17] further indicated that individual risk perception might be affected by the characteristics of the living environment where people live and psychological constructs of social adaptation. Prior works in economics has also proposed that emotions may play a critical role in decision making under risk [9, 15]. Reference [32] addressed that investing itself is an activity that induces strong emotional responses, even when the individuals involved are professional traders. However, these empirical findings do not still allow us to distinguish whether emotions influence behavior by changing risk preferences. Financial risk tolerance is another term widely used in the personal financial planning industry to refer to an investor's attitude towards risk. It can be defined as the amount of uncertainty or investment return volatility that an investor is willing to accept when making a financial decision [19, 22]. In general, higher risk taking may be explained by a higher degree of overconfidence, less herding behavior, or a lower degree of risk aversion [34].

Reference [10] addressed that herding provides a link to the behavioral economics literature which is concerned with the impact of experience, and found that young managers tend to exhibit a higher degree of herding. Since the results concerning the relationship between experience and risk taking in previous studies are rather contradictory, reference [34] provided complementary survey evidence of 117 German fund managers which can improve to understand this field. In line with the results of previous studies, they found that herding is decreasing with experience while the evidence concerning risk taking and overconfidence is mixed.

In summary, the evidence linking to the relationships of investor types, the level of risk tolerance and/or herding bias are not very clear-cut. Therefore, the motivation of this present paper is whether the BB&K model could suitable to elucidate the relationships of investor types, risk tolerance and herding bias. Moreover, if specific investors fitting specific psychological traits are more likely to exhibit specific investor biases, then this study can attempt to help individual investors recognize the relevant behavioral tendencies before investment decisions are made. In addition, by the proposed model, we will further reveal the mediate effect of risk tolerance of investors on the relationship between four investor types and herding so that some contributive investment suggestions could be therefore derived from the findings. In this way, we can more deeply understand the facets of causing herding bias.

II. Method

A. Hypotheses

Previous studies have examined that personal characteristics may lend some insight into the level of risk tolerance. For example, BB&K model classified investors into five categories that are shown to imply diffident risk tolerance [3]. Reference [5] classified investors as either passive or active. Passive investors have a greater need for security and a lower risk tolerance in comparison with active investors. Reference [6] indicated that emotions of investors can influence financial risk-taking when feedback and updating are involved. The influence of feedback has been suggested by prior findings related to the phenomenon of myopic loss aversion, in which people take less financial risk if they know that they will receive more frequent feedback about their investment outcomes. Reference [36] also pointed out that the investors with the impetuous trait would have higher risk tolerance. Reference [30] further indicated that the positive emotional states such as excitement induce people to be confident in their ability to evaluate investment options and to take higher risks, while negative emotions such as anxiety have the opposite effects. According to the aspect of [37], the personality profiles can be used to predict the risk taking of individuals in overall risk taking, and individual difference factors that could influence risk taking. Therefore, the risk taking could be linked to trans-situational factors, such as personality-risk propensity. In other words, individual differences and shorter decision-times may interact if people with particular personality traits are predisposed to make quick, emotionally-driven decisions.

Additionally, we can observe the individual investors with confident trait would be seriousness and excellence in their investing activities, so such the type of investors believes that their own performances in investment are better than other investors. Therefore, we propose the following hypothesis:

Hypothesis 1: There are significant relationships linked between personality types and risk tolerance.

In previous research, there are few evidences on linking up the relationships of personality traits and investment biases [41]. Nonetheless, some relevant clues can conducted the relationships among investor types and herding bias from the theoretical or empirical studies of behavioral finance and psychology.

Herding, one kind of investment biases, occurs when the private information of individual investors is overwhelmed by the influence of public information about the decisions of a herd or group. Psychologists indicated that personality traits would predispose individuals to particular emotional responses, and the importance of personality traits could be associated with other economic analyses focusing on the role of emotions and influence in economic and financial decision-making behavior [4, 12, 44]. In this way, personal characteristics would affect the propensity of individuals to herd. It also means that herding reflects an interaction of deliberative and affective factors.

Reference [47] suggested that investors would be lack of confidence when they have the trait of anxiety. Moreover, when the investors have the characteristics of anxiety, emotionally unstable and nervous, they always follow the investment suggestions of their friends or seek professional consultation or insider that would also lead to herding. Thus we can infer a positive linkage between anxiety and herding.

Generally speaking, individual investors with herding behavior are usually lack of confidence and professional competence to make a better investment decision so that they might take the market signs or the opinions of professional investors for the foundation of making investment decision. Thus, we start by hypothesizing that sociable, empathetic individuals are more responsive to social influence and so will be more likely to herd. In assessing the impact of visceral and/or emotional factors, we can also postulate that quickly-processed emotions may be implicated in herding in which case herding is more likely to be seen in impulsive and venturesome individuals. Therefore, we propose the second hypothesis as follows.

Hypothesis 2: There are significant relationships linked between personality types and herding bias.

Reference [46] indicated that both risk perception and risk propensity are the key inputs to risk taking and conceptualized risk propensity as a confluence of dispositional tendencies, cognitive inputs and past experience. A number of theoretical models hypothesize that an individual fund manager's risk-taking behavior is affected by other managers in his peer group, such a situation is denoted as "reputational herding" [20]. Reference [34] revealed that herding is decreasing with experience of individual. Reference [23] suggested that understanding the relationship between stock market returns and risk tolerance may help explain why investors exhibit herding behavior by purchasing risky investment during market up-trend, and selling securities during market downtrends. Based on these, we can further infer that causing deep-seat of the original herding behavior may be the differences of risk tolerance and risk preferences of investors. The third hypothesis is thus proposed:

Hypothesis 3: Risk tolerance has a significant negative impact on herding bias.

B. Instrument

Most of the prior researchers use secondary data to perform a longitudinal analysis and construct specific indicators to identify behavioral biases in investment. However, due to herding behavior explores psychological attitudes of investors towards investment decisions, primary data seem to be more likely to accurately reflect the inner motivation of individual investors. Thus, contrasting with previous studies which focus on detecting behavioral biases and the impacts of behavioral biases, this study performs a cross-section analysis via Structural Equation Modeling (SEM) that constructs a comprehensive path to link four types of investors with risk tolerance and herding bias. The causal processes are

represented by a series of structural equations that can be modeled graphically to facilitate the conceptualization of a theoretical framework [8]. Using SEM allows us to evaluate simultaneously the factor loadings and error variance of the measurements and to test the significance of the relationship between the latent variables of interest. However, for the consideration of the principle of parsimony, reference [26] argued that SEM should be simplified as much as possible in order to reduce the under-identification and to improve the goodness-of-fit of a structural model. Questionnaire is divided into four parts. The first part is concerned with the investor types that are designed to measure four psychological traits of individual investors including careful, impetuous, anxious, and confident derived from BB&K model [3]. Every investor type is regarded as a latent variable measured by 5-7 observed items. The second part is concerned with the measurement of risk tolerance which is modified from [21, 22] and measured by 9 observed items. The third part is the measurement of herding bias which is well defined in the behavioral finance and psychology literature as well as based on the theoretical works of [13, 42, 45]. Herding bias is also treated as a latent variable and measured by 7 observed items. Each item in these three parts adopts five-point Likert-scale to measure the psychological agreement of respondents. Categories for the scale ranged from strongly disagree (1) to strongly agree (5). Table I lists the measures with the reworded items. The forth part contained information about respondents for the demographics of the individual investors including gender, age, experience in investment, and whether need of support family.

For the both considerations of measurement reliability and goodness of fit of the model, the final measurement scales for each latent variable are determined that satisfy the following criterion: (a) eliminate items with communalities (item-total) lower than 0.3 [44]; (b) eliminate items with square multiple correlation (SMC) lower than 0.3; (c) eliminate items with standardized factor loadings higher than 0.95; (d) suggest the modification index (MI) provided by LISREL 8.71 package [27]. The corresponding composite reliability (ρ_c) for each latent variable is also calculated by the indicator of $\rho_c = (\sum \lambda_i)^2/[(\sum \lambda_i)^2 + \sum \theta_i]$, where λ_i denotes the standardized factor loadings on latent variables, θ_i denotes the measurement errors of observed variables. The value of ρ_c that is higher than 0.6 may be represented as good construct reliability [3]. In addition, all of the factor loadings are greater than 0.5 that represents convergent validity for the measurement of each latent variable.

Additionally, to further assure the reliability and validity of questionnaires, there are two steps to test these measures: In the first step, we have performed a pre-test with 200 convenience samples that are randomly selected from total valid 589 voluntary respondents. In the second step, the rest of 389 respondents are treated as confirmatory samples to conduct a confirmatory factor analysis (CFA) for evaluating the reliabilities and validities of constructed items. The final measures and the reliabilities of each item and composite reliability (i.e. latent variables) are shown in Table I.

By using CFA to test the reliability and validity of the measures of four investor types, risk tolerance and herding bias, we find that the goodness-of-fit of investor types with the following indices: χ^2/df =2.58, CFI=0.95, GFI=0.95, AGFI=0.92, NFI=0.93, NNFI=0.94, RMSEA=0.064, SRMR=0.056, IFI=0.96, which all indicates reasonable model fit and composite reliability as shown in Table I. References [2, 38] suggested the composite reliability must be greater than 0.5. From Table I, each factor loading of measure for latent variable are greater than 0.5 and all the composite reliabilities are greater than 0.6. It shows that the measures of the latent variables have high internal quality.

TABLE I
THE INTERNAL QUALITY OF LATENT VARIABLES

Latent variables	Measure items	SMC	Factor loadings	Composite reliability
Careful	X1	0.54	0.74	0.79
	X2	0.76	0.87	
	X3	0.40	0.63	
Impetuous	X4	0.34	0.58	0.62
	X5	0.37	0.61	
	X6	0.34	0.59	
Anxious	X7	0.43	0.65	0.80
	X8	0.77	0.88	
	X9	0.51	0.72	
Confident	X10	0.33	0.57	0.74
	X11	0.62	0.79	
	X12	0.53	0.73	
Risk tolerance	Y1	0.59	0.77	0.79
	Y2	0.67	0.82	
	Y3	0.43	0.66	
Herding	Y4	0.46	0.68	0.74
	Y5	0.66	0.81	
	Y6	0.37	0.61	

C. Data

This study adopted convenience sampling method to totally issue 600 formal questionnaires to the voluntary individual investors attending at security companies located in Taipei during Jun. 2011 to Aug. 2011. After deducting the invalid and incomplete questionnaires, 589 valid respondents have been collected, so the valid rate of response is 98%. In the composition of the valid respondents, there are 302 male and 287 female, and with 37.3% are between ages 26 to 35, with 28.3% between ages 36 to 45, and 23.9% between age 46 to 55. These ages accounted for about 90% of the entire valid respondents. The experience of investment accounted for 30.1% is between 1 to 3 years, with 27.2% is between 4 to 6 years, and with 3%.1% is above 7 years. And there are 58.4% respondents who need of support family.

D. Analytical Model

The study uses SEM to simultaneously estimate and test how latent variables and their measurements are related. Based on previous literature, a hypothetical structure equation models is proposed and analyzed with the LISREL 8.70 statistics package, respectively. Structural model is developed to explore how four investor types, risk tolerance and herding bias are related.

The structural equation model is

$$\eta_i = \gamma_{ij}\xi_j + \beta_{ij}\eta_{j+}\varsigma_i, i, j = 1, 2, 3, \ldots \quad (1)$$

where ξ_j denotes exogenous latent variables, i.e. careful, impetuous, anxious, and confident; η_i denotes endogenous latent variables, i.e. risk tolerance and herding; γ_{ij} denotes the regression coefficient of ξ_j on η_i; β_{ij} denotes the regression coefficient of η_j on η_i;and ς_i denotes the error variance of structure equation. The measurement equation model is

$$X_i = \lambda_{xij}\xi_j + \delta_i, \quad (2)$$

$$Y_i = \lambda_{yij}\eta_j + \varepsilon_i, \quad (3)$$

where; λ_{xij} denotes the regression coefficient of X_i on ξ_j; λ_{yij} denotes the regression coefficient of Y_i on $\eta_{i,j}$; δ_i, ε_i denote measurement errors of exogenous (ξ_j) and endogenous (η_i) latent variables, respectively.

By using maximum likelihood estimation, the fitness indices of the structure models are assessed by goodness of fit index (GFI), comparative fit index (CFI), and non-normed fit index (NNFI), where the values greater than 0.90 are regarded as acceptable. A situation in which the value of the root mean square error of approximation (RMSEA) is 0.05 or lower implies that it is a close fit. Additionally, values up to 0.08 are recognized as a reasonable error of approximation. In addition, according to the principle of parsimony, Critical N (CN) should be greater than 200 [25], parsimony normed fit index (PNFI) should be higher than 0.5, and normed chi-square (χ^2/df) should be lower than 0.3.

TABLE II
THE DESCRIPTIVE STATISTICS FOR LATENT VARIABLES

Latent variables	Items	Mean	SD	Skewness	Kurtosis
	X1	3.65	0.88	- 0.65	- 0.13
Careful	X2	3.60	0.83	- 0.47	- 0.33
	X3	3.55	0.85	- 0.36	- 0.52
	X4	3.02	0.95	- 0.12	- 0.87
Impetuous	X5	3.15	0.90	- 0.15	- 0.92
	X6	2.96	0.99	0.00	- 0.97
	X7	2.95	0.97	0.05	- 0.97
Anxious	X8	2.88	0.94	0.23	- 1.00
	X9	3.06	0.98	0.04	- 1.13
	X10	3.23	0.89	- 0.33	- 0.49
Confident	X11	3.27	0.88	- 0.42	- 0.59
	X12	3.19	0.87	- 0.17	- 0.84
	Y1	2.94	1.01	0.03	- 1.00
Risk tolerance	Y2	2.96	1.02	- 0.08	- 1.03
	Y3	2.82	1.04	0.05	- 0.89
	Y4	2.93	0.97	- 0.03	- 1.36
Herding	Y5	2.97	0.89	0.04	- 1.08
	Y6	3.13	0.93	- 0.02	- 0.90

n=589

III. RESULTS

A. Diagnosis of Offending Estimation

The standardized estimation coefficients among investor types, risk tolerance and herding bias are shown in Fig. 1. From Fig. 1, we find that the values of variance errors are positive between 0.23 and 0.91. In addition, factor loadings are shown between the values of 0.57 and 0.88 (smaller than 0.95).

Thus, ensuring the hypothesized model has no the phenomenon of offending estimation, it could proceed with the estimation of parameters. In addition, the absolute values of skewness and kurtosis for all observed items are lower than 3 and 10 (see Table II), respectively. It means that all of these measurements could be regarded as approximate normal distribution and Maximum Likelihood method is suitable to be used to estimate the parameters in the proposed model [29].

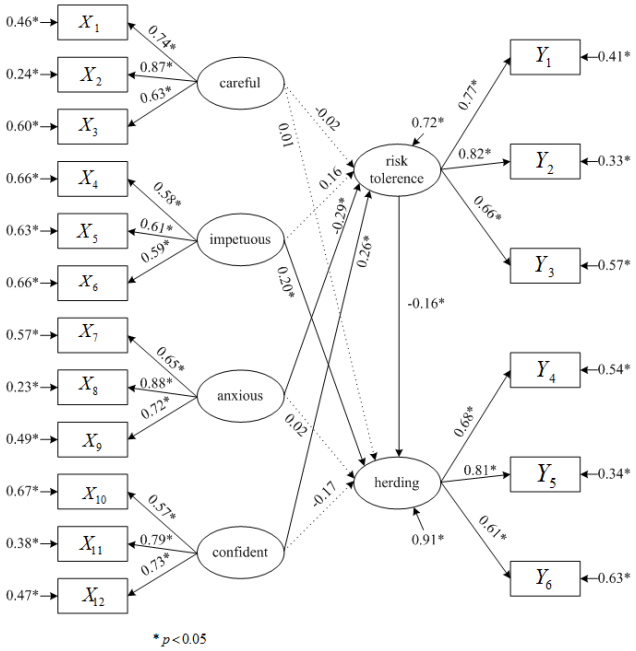

Fig. 1 The structure relationship of four investor types, risk tolerance and herding

B. Goodness-of-Fit Test

According to the criteria of goodness of fit suggested by [24], this proposed structural model has good model fit (χ^2/df= 2.78, CFI= .93, GFI= .95, AGFI= .88, NFI= .91, NNFI= .91, RMSEA= .068, SRMR= .061 and IFI= .93). It means that the structural equation models can fit with the data well.

C. Estimation of Parameters

By Fig. 1 and Table III, the risk tolerance has a negatively significant impact on herding bias (β_{21}= -.16, p<.05). It implies that the investors with higher level of risk tolerance would exhibit lower herding. In addition, the investors with higher anxious trait would have a lower level of risk tolerance (γ_{13}= -0.29, p<.05); oppositely, the investors with higher confident would have a higher level of risk tolerance (γ_{14}= .26, p<.05). Especially, only the type of impetuous investors would have a directly impact on herding bias (γ_{22}= .20, p<.05). It means that the investors with the impetuous trait would directly rely on the suggestions of reference group or other institutional investors. Namely, when they have involved in the stock market, they would be prone to invest according to the majority of opinions or investment experiences. This finding is corresponding to the findings of [42].

D. The Mediate Effect

According to the criteria of goodness of fit suggested by [24], this proposed structural model has good model fit (χ^2/df = 2.78, CFI= .93, GFI= .95, AGFI= .88, NFI= .91, NNFI= .91, RMSEA= .068, SRMR= .061 and IFI= .93). It means that the structural equation models can fit with the data well.

TABLE III
THE ESTIMATED PARAMETERS OF FOUR INVESTOR TYPES, RISK TOLERANCE AND HERDING BIAS

Parameters	Standardized coefficients	t values	Parameters	Standardized variance errors	t values
$\lambda_{x1,1}$	0.74	14.76*	δ_1	0.46	9.39*
$\lambda_{x2,1}$	0.87	17.70*	δ_1	0.24	4.60*
$\lambda_{x3,1}$	0.63	12.50*	δ_1	0.60	11.76*
$\lambda_{x4,2}$	0.58	9.55*	δ_1	0.66	9.96*
$\lambda_{x5,2}$	0.61	9.89*	δ_1	0.63	9.42*
$\lambda_{x6,2}$	0.59	9.60*	δ_1	0.66	9.87*
$\lambda_{x7,3}$	0.65	13.16*	δ_1	0.57	11.66*
$\lambda_{x8,3}$	0.88	18.62*	δ_1	0.23	4.77*
$\lambda_{x9,3}$	0.72	14.67*	δ_1	0.49	10.41*
$\lambda_{x10,4}$	0.57	10.86*	δ_1	0.67	12.01*
$\lambda_{x11,4}$	0.79	15.45*	δ_1	0.38	7.25*
$\lambda_{x12,4}$	0.73	14.27*	δ_1	0.47	8.99*
$\lambda_{y1,5}$	0.77	-	ε_1	0.41	8.93*
$\lambda_{y2,5}$	0.82	13.06*	ε_1	0.33	7.00*
$\lambda_{y3,5}$	0.66	11.67*	ε_1	0.57	11.45*
$\lambda_{y4,6}$	0.68	-	ε_1	0.54	9.44*
$\lambda_{y5,6}$	0.81	9.61*	ε_1	0.34	5.25*
$\lambda_{y6,6}$	0.61	9.51*	ε_1	0.63	11.20*
γ_{11}	- 0.02	- 0.25	γ_{13}	- 0.29	- 4.05*
γ_{21}	- 0.01	0.17	γ_{23}	0.02	0.23
γ_{12}	0.16	1.96	γ_{14}	0.26	3.18*
γ_{22}	0.20	2.15*	γ_{24}	- 0.17	- 1.82
β_{21}	- 0.16	- 2.00*	ς_1	0.72	7.39*
			ς_2	0.91	6.20

$*$ $p < 0.05$; "-" represents the reference indicator

IV. CONCLUSION

In this paper we have revealed that some psychological characteristics of people are relevant to their herding behaviors and risk tolerance of individual investors through constructing a concrete structural equation model. And we further examine the mediate effect of risk tolerance between different types of investors and herding bias. The results show that the impetuous investors would directly become herding but rather be impacted by the mediator of risk tolerance. For the careful investors, there is no significant evidence to link their levels of risk tolerance with herding bias. Concerning the mediate effect between the types of investors and herding bias, the level of confidence seems to indirectly impact on herding bias through the fully mediate effect of risk tolerance. In other words, the more anxious investors would possess lower level of risk tolerance which eventually results in herding, but comparatively for the confident investor, they have higher risk tolerance and are less likely to form herding bias. Since herding behavior is regarded as an irrational investment behavior, and it might result in a negative performance of investment, we may conclude the following suggestion based on the findings: First, the investors with stronger impetuous personality should set up a stop-loss point and a lock-gain point before their investment, so as to avoid the loss resulted from the bias of herding. Second, the investors with more confident or less anxious personality traits should further confirm the market information and make up their minds on investing so as to avoid forming the bias of herding. This paper provides the individual investors with comprehensive ideas on investing in order to improve their investment performance.

REFERENCES

[1] D. G. Allen, R. W. Renn, K. R. Moffitt, and J. M. Vardaman, "Risky business: The role of risk in voluntary turnover decisions," *Hum. Resource Manag. Rev.*, vol. 17, no. 3, pp. 305-318, 2007.
[2] R. P. Bagozzi, and Y. Yi, "On the evaluation of structural equation models," *J. Acad. Market. Sci*, vol. 16, pp. 74-94, 1988.
[3] T. E. Bailard, D. L. Biehl, and R. W. Kaiser, Personal Money Management (5th ed.). Chicago, Ill.: Science Research Associates, 1986.
[4] M. Baddeley, "Herding, social influence and economic decision-making: Socio-psychological and neuroscientific analyses," *Phil. Trans. Biol. Sci.*, vol. 365, pp.281-90, 2010.
[5] M. M. Barnewall, "Psychological characteristics of the individual investor." In W. Droms, ed., *Asset Allocation for the Individual Investor*. Charlottesville, VA.: The Institute of Chartered Financial Analysts, 1987.
[6] S. Benartzi, and H. R. Thaler, "Myopic loss aversion and the equity premium puzzle," *Q. J. Econ.*, vol. 110, no. 1, pp. 73-92, 1995.
[7] R. Bye, and G. M. Lamvik, "Professional culture and risk perception: Coping with danger on board small fishing boats and offshore service vessels," *Reliab. Eng. Syst. Saf.*, vol. 92, pp. 1756-1763, 2007.
[8] B. M. Byrne, *Structural Equation Modeling with AMOS - Basic Concepts, Applications, and Programming*, Mahwah, New Jersey: Lawrence Erlbaum Associates, 2001.
[9] A. Caplin, and J. Leahy, "Psychological expected utility theory and anticipatory feelings," *Q. J. Econ.*, vol. 116, pp. 55-79, 2001.
[10] J. Chevalier, and G. Ellison, "Career concerns of mutual fund managers," *Q. J. Econ.*, vol. 114, no. 2, pp. 389-432, 1999.
[11] P. T. Jr. Costa, and R. R. McCrae, Revised NEO Personality Inventory and NEO Five-Factor Inventory: Professional Manual. FL: Psychological Assessment Resources, 1992.
[12] S. DellaVigna, "Psychology and economics: Evidence from the field," *J. Econ. Lit.*, vol. 47, no. 2, pp. 315-372, 2009.
[13] A. Devenow, and I. Welch. "Rational herding in financial economics," *Eur. Econ. Rev.*, vol. 40, no. 3-5, pp. 603-615, 1996.
[14] W. G. Doubleday, "Expected utility and the cumulative consequences of repeated decisions: a tutorial," *Risk, Decision and Policy*, vol. 7, pp. 109-119, 2002.
[15] J. Elster, "Emotions and economic theory," *J. Econ. Lit.*, vol. 36, pp. 47-74, 1998.
[16] N. S. Endler, and D. Magnusson, "Toward an interactional psychology and personality," *Psychol. Bull.*, vol. 83, no. 5, pp. 956-974, 1976.
[17] E. Engelberg, and L. Sjöberg, "Money obsession, social adjustment, and economic risk perception," *J. Soc. Econ.*, vol. 36, pp. 686-697, 2007.
[18] R. Garvey, A. Murphy, and F. Wu, "Do losses linger," *The Journal of Portfolio Management*, vol. 33, no. 4, pp. 75-83, 2007.
[19] J. E. Grable, "Financial risk tolerance and additional factors that affect risk taking in everyday money matters," *J. Bus.Psychol.*, vol. 14, pp. 625-630, 2000.
[20] J. R. Graham, "Herding among investment newsletters: Theory and evidence," *J. Finance.*, vol. 54, pp. 237-268, 1999.
[21] J. E. Garble, and S. H. Joo, "A Cross-disciplinary examination of financial risk tolerance," *Consumer Interests Annual*, vol. 46, pp. 151-157, 2000.
[22] J. E. Garble, and R. H. Lytton, "Financial risk tolerance revisited: The development of a risk assessment instrument," *Financ. Serv. Rev.*, vol. 8, no. 3, pp. 163-181, 1999.
[23] J. E. Garble, R. H. Lytton, and B. O'Neill, "Projection bias and financial risk tolerance," *J. Behav. Finance.*, vol. 5, no. 3, pp. 142-147, 2004.
[24] J. F. Hair, R. E. Anderson, R. L. Tatham, and W. C. Black, *Multivariate Data Analysis* (5th ed.). Prentice Hall International: UK, 1998.
[25] J. W. Hoelter, "The analysis of covariance structures: Goodness-of-fit indices," *Socio. Meth. Res.*, vol. 11, no. 3, pp. 325-344, 1983.

[26] L. A. Hayduk, *Structural Equation Modeling with LISREL: Essentials and Advances*, Baltimore, MD: John Hopkins University Press, 1987.K. C. Jöreskog, and D. Sörbom, *LISREL VIII: Reference Guide*, Scientific Software International Inc., Chicago, 1993.
[27] D. Kahneman, and A. Tversky, "Prospect theory: an analysis of decision under risk," *Econometrica*, vol. 47, no. 2, 1979, pp. 263-291.
[28] R. B. Kline, *Principles and Practice of Structural Equation Modeling*, New York: Guilford Press, 1998.
[29] C. M. Kuhnen, and B. Knutson, "The Influence of Affect on Beliefs, Preferences, and Financial Decisions," *J. Financ. Quant. Anal.*, vol. 46, no. 03, pp. 605-626, 2011.
[30] M. G. Lipe, "Individual investors' risk judgments and investment decisions: the impact of accounting and market data," *Account. Org. Soc.*, vol. 23, pp. 625-640, 1998.
[31] A. Lo, and D. Repin, "The psychophysiology of real-time financial risk processing," *J. Cognit. Neurosci.*, vol. 14, no. 3, pp. 323–339, 2002.
[32] S. Maital, R. Filer, and J. Simon, "What do people bring to the stock market (beside money)?" The Economic Psychology of Stock Market Behavior, In B. Gilad and S. Kaish (Eds.), *Handbook of Behavioral Economics Behavioral Macroeconomics*, vol. B, Greenwich, Connecticut, JAI Press Inc., 1986, pp. 273-307.
[33] L. Menkhoff, U. Schmidt, and T. Brozynski, " The impact of experience on risk taking, overconfidence, and herding of fund managers: Complementary survey evidence," *Eur. Econ. Rev.*, vol. 50, pp. 1753-1766, 2006.
[34] I. B. Myers, and M. H. McCaulley, *Manual: A guide to the Development and Use of the Myer Briggs Type Indicator*. Palo Alto, CA: Consulting Psychologist Press, Inc., 1985.
[35] M. M. Pompian, Behavioral Finance and Wealth Management: Building Optimal Portfolios that account for investor biases. Hoboken, NJ: John Willey & Sons, Inc., 2006.
[36] N. Nicholson, E. Soane, M. Fenton-O'Creevy, and P. Willman, "Personality and domain-specific risk taking," *J. Risk. Res.*, vol. 8, no. 2, pp. 157-176, 2005.
[37] R. Raine-Eudy, "Using structural equation modeling to test for differential reliability and validity: An empirical demonstration," *Structural Equation Modeling*, 2000, vol. 7, no. 1, pp. 124-141.
[38] J. R. Ritter, "Behavioral finance," *Pac. Basin. Finance J.*, vol. 11, pp. 429-437, 2003.
[39] J. B. Rotter ,"Generalized expectancies for internal versus external control of reinforcements," *Psychol. Monogr.*, vol. 80, pp.1-27, 1966.
[40] P. S. Schaefer, C. C. Williams, A. S. Goodie, and, W. K. Campbell, "Overconfidence and the Big Five," *J. Res. Pers.*, vol. 38, pp. 473-480, 2004.
[41] D. S. Scharfstein, J. C. Stein, "Herd behavior and investment,' *Am. Econ. Rev.*, vol. 80, no.3, pp. 465-479, 1990.
[42] S. Sehgal, and N. Tripathi, "Investment strategies of FIIs in the Indian equity market," *J. Bus. Perspect.*, vol. 13, no. 1, pp. 11-18, 2009.
[43] B. Shiv, G. Loewenstein, A. Bechara, H. Damasio, and A. R. Damasio, "Investment behavior and the negative side of emotion," *Psychol. Sci.*, vol. 16, no. 6, 435-439, 2005.
[44] W. R. Sias, "Institutional herding," *The Review of Financial Studies*, vol. 17, no. 1, pp. 165-206, 2004.
[45] S. B. Sitkin, and A. L. Pablo, "Reconceptualizing the determinants of risk behavior," *Acad. Manag. Rev.*, vol. 17, pp. 9-38, 1992.
[46] E. R. Stone, C. L. Dodrill, and N. Johnson, "Depressive cognition: A test of depressive realism versus negativity using general knowledge questions," *J. Pers.*, vol. 135, no.6, pp. 583-602, 2001.
[47] J. Yang, and W. Qiu, "A measure of risk and a decision-making model based on expected utility and entropy," *Eur. J. Oper. Res.*, vol. 164, pp. 792-799, 2005.

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