

THE INFLUENCE OF BEHAVIORAL BIASES ON INVESTMENT DECISION-MAKING AMONG INVESTORS IN SABAH

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ABSTRACT

Retail investor participation in Sabah has increased considerably in recent years, reflecting growing interest in financial markets and expanding investment opportunities across various demographic segments. As more individuals engage in investment activities, understanding the behavioural factors that influence investment decision-making becomes increasingly important. Investment decision-making is often made under conditions of uncertainty, where cognitive and emotional biases may affect investors' judgments and actions. Although behavioural finance has received substantial scholarly attention, empirical evidence examining behavioural biases among investors in Sabah remains limited. Furthermore, there is a need for greater understanding of how key behavioural biases influence investment decision-making within the Sabah context. This study investigates the influence of three behavioural biases, namely loss aversion bias, overconfidence bias, and herding bias, on investment decision-making among investors in Sabah. Guided by Prospect Theory, the study examines how these behavioural tendencies shape investors' decisions in financial markets. Data were collected through an online survey using purposive and snowball sampling techniques. A total of 160 valid responses were obtained from retail investors in Sabah, exceeding the minimum sample size of 138 recommended by G-Power. The data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM) through SmartPLS 4.1.1.6. The findings provide empirical evidence on the role of behavioural biases in influencing investment decision-making among investors in Sabah. The study contributes to behavioural finance literature by refining Prospect Theory and Social Learning Theory within an emerging regional market context, demonstrating how collective social transmission mechanisms can eclipse individual cognitive biases in low-participation financial environments. The findings also offer practical implications for investors, financial educators, policymakers, and market practitioners by highlighting the importance of behavioural awareness in improving investment decision quality and supporting more informed investment decision-making.

INTRODUCTION

Investment participation among retail investors in Sabah remains relatively low despite the growing availability of financial products, digital trading platforms, and investment opportunities. According to Bursa Malaysia (2024), only approximately 30,000 individuals in Sabah hold Central Depository System (CDS) accounts, representing about 1% of the state's population. As investors are exposed to greater volumes of information, market volatility, and uncertainty, investment decision-making becomes increasingly complex. Under such conditions, investment decision-making may not be based solely on rational evaluation but may also be associated with psychological and behavioural factors that influence judgement and decision-making processes.

Behavioural finance literature suggests that investors are susceptible to behavioural biases such as loss aversion, overconfidence, and herding, particularly when decisions are made under uncertainty (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992). These behavioural biases have received substantial attention in prior studies and have been associated with variations in investor judgement and decision outcomes across different financial contexts (Yanti & Endri, 2024; Hashim et al., 2026). Loss aversion reflects investors' tendency to place greater weight on potential losses than equivalent gains, overconfidence refers to the tendency to overestimate one's knowledge and forecasting abilities, while herding describes the tendency to follow the actions and opinions of other market participants. Together, these biases may shape how investors evaluate information and engage in investment-related decisions.

PROBLEM STATEMENT

Despite increasing accessibility to capital markets and the expansion of online investment platforms, a significant participation gap persists among retail investors in Sabah. While there is a growing body of behavioural finance research addressing investment decisions, empirical evidence focusing specifically on investors in Sabah remains limited. Existing studies predominantly examine broader Malaysian samples or other geographical settings, providing limited understanding of investor behaviour within Sabah's unique demographic, socioeconomic, and geographical environment.

Given Sabah's relatively low participation in capital markets and the scarcity of context-specific empirical evidence, further investigation is needed to understand how behavioural biases are associated with investment decision-making among retail investors in the state. Accordingly,

this study examines the influence of loss aversion bias, overconfidence bias, and herding bias on investment decision-making among retail investors in Sabah. The study advances behavioural finance literature by critically evaluating the boundary conditions of Prospect Theory and Social Learning Theory in a regional economy characterized by low capital market penetration. Rather than offering a mere contextual replication, this research refines existing theoretical frameworks by demonstrating how collective social influences (herding) override individual heuristics (loss aversion and overconfidence) when retail investors navigate market uncertainty. Furthermore, it offers practical insights for policymakers, financial institutions, and investor education providers seeking to promote more informed investment participation and decision-making.

RESEARCH OBJECTIVE

The main objective of this study is to examine the influence of behavioural biases on investment decision-making among investors in Sabah. Specifically, the study aims to:

RO1: To examine the influence of loss aversion bias on investment decision-making among investors in Sabah.

RO2: To examine the influence of overconfidence bias on investment decision-making among investors in Sabah.

RO3: To examine the influence of herding bias on investment decision-making among investors in Sabah.

LITERATURE REVIEW

Prospect Theory

Prospect Theory explains decision-making under uncertainty through reference dependence and asymmetric evaluation of gains and losses. Loss aversion leads investors to overweight potential losses, which shapes cautious or delayed decisions. At the same time, overconfidence distorts judgment by inflating belief in one's knowledge and control, often reducing sensitivity to risk. These mechanisms influence how investors process uncertainty and form risk perceptions as cognitive filters for decision-making.

Empirical evidence shows consistent effects of loss aversion on conservative behaviour and disposition patterns, while overconfidence often drives excessive trading and risk-taking. However,

findings remain mixed across contexts, particularly across investor groups and market conditions. Some studies report weak or insignificant effects, suggesting that behavioural biases do not translate uniformly into decision outcomes. This inconsistency indicates that underlying cognitive mechanisms, such as risk perception, play a critical role in shaping the final decision.

Social Learning Theory

Social Learning Theory explains behaviour through observational learning and interaction. In financial markets, this process manifests as herding, in which investors rely on others' actions when facing uncertainty. Herding reflects the use of social information as a shortcut to interpret complex market signals.

Empirical findings show that herding intensifies under uncertainty and can lead to correlated trading behaviour. However, its effect on decision-making is inconsistent. Some evidence links herding to reduced decision quality, while other findings suggest it may improve decisions when collective information is informative. These mixed results indicate that herding operates through perceptual mechanisms rather than direct behavioural effects alone.

Framework and Hypothesis Development

The conceptual framework in Figure 1, developed for this study, examines the direct effects of three behavioural biases, namely loss aversion bias, overconfidence bias, and herding bias, on investment decision-making among investors in Sabah. The dependent variable in this study is investment decision-making. Grounded in behavioural finance theory, particularly Prospect Theory and Social Learning Theory, the framework proposes that behavioural biases influence how investors evaluate financial information, perceive investment risk, and make investment-related decisions. Collectively, these behavioural biases are expected to influence the rationality and quality of investment decision-making among retail investors in Sabah (Kahneman & Tversky, 1979; Barber & Odean, 2001; Banerjee, 1992).

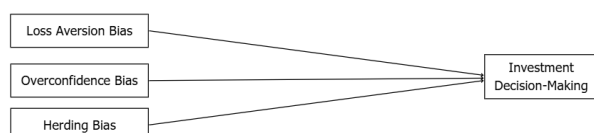


Figure 1: Research framework for investment decision-making

Behavioural biases shape investment decision-making through both direct and indirect pathways. Loss aversion is expected to reduce investment engagement due to heightened

sensitivity to losses. Overconfidence is expected to increase participation but may lead to suboptimal decisions due to underestimating risk. Herding is expected to influence decisions through reliance on social cues, particularly under uncertainty.

Thus, three hypotheses were formulated to guide the study's research problems and aims.

H1: Loss aversion bias significantly influences investment decision-making among investors in Sabah.

H2: Overconfidence bias significantly influences investment decision-making among investors in Sabah.

H3: Herding bias significantly influences investment decision-making among investors in Sabah.

METHODOLOGY

This study adopted a positivist research philosophy and employed a quantitative cross-sectional survey design. The target population consisted of retail investors in Sabah, particularly those residing in Kota Kinabalu, Sandakan, and Tawau. Data were collected using a structured questionnaire administered through Google Forms and distributed via social media platforms, investment-related groups, and investor networks. Given the absence of a comprehensive sampling frame for retail investors in Sabah, non-probability purposive and snowball sampling techniques were employed. Based on G-Power analysis, the minimum required sample size was 138 respondents. A total of 160 valid responses were obtained and used for the final analysis. However, several methodological limitations must be acknowledged. The deployment of non-probability purposive and snowball sampling techniques restricts the study's external validity. These methods are inherently susceptible to sampling and self-selection bias, as respondents who volunteered or shared the survey may have distinct characteristics or greater financial interest than the broader population of retail investors in the region. Consequently, caution is warranted when generalizing these findings to the entire investor population in Sabah, and the results should be interpreted within the specific boundaries of this sampled cohort.

All constructs were measured using established multi-item scales adapted from prior studies and assessed using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The study examined four constructs, namely investment decision-making, loss aversion bias, overconfidence bias, and herding bias. In this

study, investment decision-making refers to the extent to which investors actively engage in the investment decision-making process, including information evaluation, investment planning, and decision execution, rather than the quality or success of the investment outcomes. Data screening procedures included assessing missing values, response inconsistencies, outliers, and multivariate normality. As the data did not satisfy normality assumptions, Partial Least Squares Structural Equation Modelling (PLS-SEM) was employed using SmartPLS 4.1.1.6, while SPSS was used for preliminary data analysis. PLS-SEM was considered appropriate due to its suitability for examining complex predictive relationships and its robustness in handling non-normally distributed data. The significance of the structural relationships was evaluated using the bootstrapping procedure with a significance level of 0.05.

FINDINGS

Common Method Variance

Common method bias was assessed using the full collinearity approach proposed by Kock and Lynn (2012). The Variance Inflation Factor (VIF) values for all constructs were below the threshold of 3.3, indicating that common method bias was not a significant concern in this study.

Table 1: Full Collinearity

Model	VIF
Loss Aversion Bias	1.444
Overconfidence	1.647
Herding	1.755
Investment Decision-Making	3.189

Respondent Profile

This study involved 160 eligible respondents, capturing a diverse demographic profile that provides insights into the socio-economic and professional backgrounds of the participants. The sample comprised slightly more male respondents (53.75%, n=86) than females (46.25%, n=74), reflecting a relatively balanced gender distribution.

Regarding age, most respondents were between 29 and 44 years old (54.37%, n=87), followed by those aged 45 to 59 years (31.87%, n=51), and a smaller group aged 60 to 79 years (13.75%, n=22). The respondents were distributed across major districts in Sabah, with the largest proportion residing in Kota Kinabalu (41.25%, n=66), followed by Sandakan (31.87%, n=51) and Tawau (26.88%, n=43).

The respondents represent a highly educated group, with most holding a bachelor's degree (45.62%, n=73). This is followed by those with a

master's degree (13.12%, n=21) and SPM-level qualifications (13.12%, n=21). A notable proportion also hold doctoral degrees (12.50%, n=20) or have completed STPM, diploma, or matriculation programmes (11.88%, n=19), while a small minority possess other (2.50%, n=4) or professional qualifications (1.25%, n=2). In terms of employment, the largest share of respondents works in the private sector (41.88%, n=67), followed by the public sector (30.00%, n=48) and the self-employed (20.00%, n=32). A minimal number were unemployed (4.38%, n=7) or receiving retirement benefits (3.75%, n=6).

A significant majority of respondents reported a monthly income of RM 5,249 or less (64.38%, n=103), placing them primarily in the lower-income group. Meanwhile, 28.75% (n=46) earned between RM 5,250 and RM 11,819, and only 6.88% (n=11) earned RM 11,820 and above. Regarding investment experience, nearly half of the respondents have two years or less (45.00%, n=72), followed by those with two to five years (28.75%, n=46). Those with five to ten years (13.12%, n=21) and over ten years (13.12%, n=21) of experience were evenly split.

Despite this relatively novice profile and the financial constraints associated with lower income, more than half of the respondents invest on a regular monthly basis (52.50%, n=84), rather than occasionally (43.12%, n=69), daily (3.12%, n=5), or weekly (1.25%, n=2). This pattern suggests that lower-income investors may prefer safer, smaller-scale, and more consistent investment approaches. In this context, given their limited experience, these individuals may also rely more heavily on external sources of information, such as friends, family, social media, investment communities, and prevailing market trends, when making investment decisions. The respondent profile is summarized in Table 2.

Table 2: Respondents' Profile

Demographic	Categories	Total (n)	Percentage (%)
Gender	Male	86	53.75
	Female	74	46.25
Age	29-44 years old	87	54.37
	45-59 years old	51	31.87
	60-79 years old	22	13.75
District of residence	Kota Kinabalu	66	41.25
	Sandakan	51	31.87
	Tawau	43	26.88
Academic qualifications	Bachelor's Degree	73	45.62
	Master's Degree	21	13.12
	SPM	21	13.12
	Doctoral Degree (PhD/DBA)	20	12.5
	STPM/Diploma/Matriculation	19	11.88
	Others	4	2.50
Employment	Professional Qualifications	2	1.25
	Private Sector	67	41.88
	Public Sector	48	30.00
	Self-Employed	32	20.00
	Unemployed	7	4.38
Income level	Retirement Benefits	6	3.75
	RM 5,249 and below	103	64.38
	RM 5,250 – RM 11,819	46	28.75
	RM 11,820 and above	11	6.88
Investment experience	2 years and below	72	45.00
	2-5 years	46	28.75
	5-10 years	21	13.12
	10 years and above	21	13.12
Investment frequency	Monthly	84	52.50
	Occasionally	69	43.12
	Daily	5	3.12
	Weekly	2	1.25

Measurement Model Assessment

The results of the composite reliability (CR) and convergent validity tests for the constructs are presented in Table 3. The findings indicate that the constructs under study have high internal consistency (Roldán & Sánchez-Franco, 2012) and sufficient average variance extracted (AVE) to support convergent validity (Hair et al., 2017). One item, LAB4, was deleted due to low loadings to ensure that the composite reliability remains above the recommended threshold of 0.708 (Hair et al., 2010; Hair et al., 2014). Furthermore, the remaining indicators for each construct exhibit satisfactory factor loadings, as recommended by Hair et al. (2017). Specifically, the Cronbach's Alpha and Composite Reliability (CR) values of loss aversion bias are 0.797 and 0.862, overconfidence bias are 0.857 and 0.890, herding bias are 0.797 and 0.861, and investment decision-making are 0.879 and 0.909, implying that these constructs possess high internal consistency. In the same vein, these constructs also demonstrate satisfactory convergent validity, with the average variance extracted (AVE) values exceeding the 0.5 threshold, indicating that the indicators explain more than 50% of each construct's variance.

Table 3: Measurement Model Assessment

Construct	Item	Loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Loss Aversion Bias	LAB1	0.708	0.797	0.862	0.558
	LAB2	0.783			
	LAB3	0.755			
	LAB5	0.774			
	LAB6	0.622			
	OB1	0.756			
Overconfidence Bias	OB2	0.783	0.857	0.890	0.576
	OB3	0.760			
	OB4	0.758			
	OB5	0.768			
	OB6	0.725			
	HB1	0.868			
Herding Bias	HB2	0.883	0.797	0.861	0.561
	HB3	0.784			
	HB4	0.623			
	HB5	0.520			
	HB6	0.766			
	IDM1	0.776			
Investment Decision-Making	IDM2	0.860	0.879	0.909	0.628
	IDM3	0.860			
	IDM4	0.596			
	IDM5	0.800			
	IDM7	0.776			
	IDM8	0.860			

**Note: LAB4 was deleted due to low loadings, Composite Reliability > .708 (Hair et al., 2010, & Hair et al., 2014)*

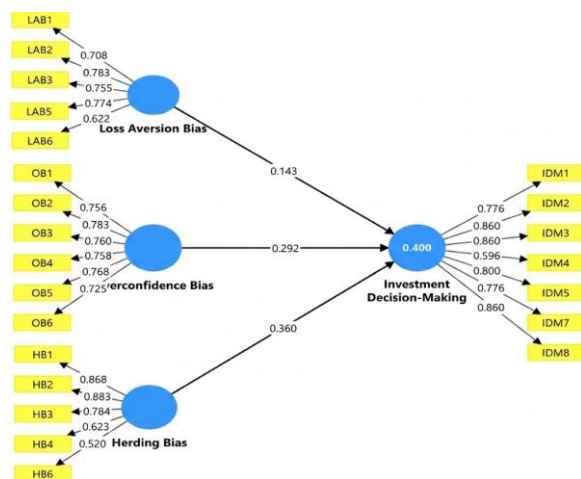
**Figure 2:** Measurement model assessment

Table 4 presents the HTMT criterion for assessing discriminant validity (Ringle et al., 2024). The finding indicates that discriminant validity is well established with an HTMT of 0.85 (Diamantopoulos & Siguaw, 2006). This study applied Henseler's (2015) heterotrait-monotrait ratio of correlations criterion to evaluate discriminant validity. The finding suggests that the correlation values for the respective constructs did not violate the most conservative criterion (HTMT.85), which indicates that the discriminant validity issue is of no concern. The finding indicated that it is appropriate to proceed with the structural model assessment to test the study's hypotheses, as there is no multicollinearity among items loaded onto different constructs in the outer model.

Table 4: HTMT criterion

	Loss Aversion Bias	Overconfidence Bias	Herding Bias	Investment Decision-Making
Loss Aversion Bias	0.286			
Overconfidence Bias	0.452	0.444		
Herding Bias	0.390	0.493	0.555	
Investment Decision-Making				

Criteria: Discriminant validity is established at HTMT 0.85 (Diamantopoulos & Siguaw, 2006)

Structural Model Assessment

i. Path Coefficient

The structural model assessment examines the relationships among the constructs in the research framework. This study addresses multicollinearity by conducting a collinearity test before estimating the structural model. The VIF values for each construct were below 3.3, suggesting that multicollinearity is not a concern (Diamantopoulos & Siguaw, 2006). Subsequently, a 5000-bootstrap data resampling was conducted to examine this study's hypotheses (Hair et al., 2017). The beta values for each path relationship in Table 5 represent the path coefficients.

The results show that only one hypothesis for the direct effect was supported, while the other two were unsupported. The results for direct effects indicate that herding bias (HB) positively influences investment decision-making (IDM). However, loss aversion bias (LAB) and overconfidence bias (OB) do not significantly influence investment decision-making. Specifically, the study found support for H3 (Herding Bias → Investment Decision-Making, $\beta = 0.143$, $p = 0.023$, LLCI = 0.024, ULCI = 0.269) but did not find support for H1 (Loss Aversion Bias → Investment Decision-Making, $\beta = -0.005$, $p = 0.940$, LLCI = -0.126, ULCI = 0.126) and H2 (Overconfidence Bias → Investment Decision-Making, $\beta = -0.038$, $p = 0.545$, LLCI = -0.163, ULCI = 0.077).

Table 5: Path coefficient

Direct Effect	Beta	S.E.	t-value	p-value	LLCI	ULCI	Decision
LAB -> IDM	-0.005	0.066	0.075	0.940	-0.126	0.126	Unsupported
OB -> IDM	-0.038	0.063	0.605	0.545	-0.163	0.077	Unsupported
HB -> IDM	0.143	0.063	2.280	0.023	0.024	0.269	Supported

LAB: Loss Aversion Bias; OB: Overconfidence Bias; HB: Herding Bias; IDM: Investment Decision-Making
Note: * $p < 0.05$, ** $p < 0.01$, Bias Corrected, LL=Lower Limit, UL=Upper Limit, p-value of 0.01, 0.05 (Hair et al, 2017)

ii. Model Quality Assessment

The study assessed the predictive power and validity of the structural model through three key metrics: effect size (f^2), coefficient of determination (R^2), and multicollinearity diagnostics. Analysis revealed that herding bias had a moderate effect on investment decision-making ($f^2 = 0.149$), while overconfidence bias ($f^2 = 0.113$) and loss aversion bias ($f^2 = 0.027$) showed small predictive effects (Cohen, 1988). The R^2 value of 0.400 demonstrated that the exogenous variables collectively explained a substantial portion of the variance in the endogenous variable, confirming the model's explanatory power (Chin, 1998; Cohen, 1989).

Multicollinearity assessment using the Variance Inflation Factor (VIF) showed that all values were well below the conservative threshold of 3.3 (Diamantopoulos & Siguaw, 2006) and the more lenient cut-off of 5.0 (Hair et al., 2017), indicating no concerning multicollinearity that might compromise the model's estimates. These results collectively validate the robustness of the structural model, support the hypothesized relationships among loss aversion bias, overconfidence bias, herding bias, and investment decision-making, and confirm the reliability of the path coefficient estimates in the PLS-SEM analysis. Adequate effect sizes and the absence of multicollinearity concerns provide confidence in the model's ability to explain investment decision-making through the examined constructs.

Table 6: Model quality assessment

Direct Effect	f^2	R^2	VIF
H1: LAB -> IDM	0.027	0.400	1.271
H2: OB -> IDM	0.113	0.400	1.259
H3: HB -> IDM	0.149	0.400	1.453

LAB: Loss Aversion Bias; OB: Overconfidence Bias; HB: Herding Bias; IDM: Investment Decision-Making

$f^2 \geq 0.35$ is considered substantial (Cohen, 1988)

$R^2 \geq 0.26$ is considered substantial (Cohen, 1989)

VIF ≥ 3.3 (Diamantopoulos & Siguaw, 2006) or ≤ 5.0 (Hair et al., 2017)

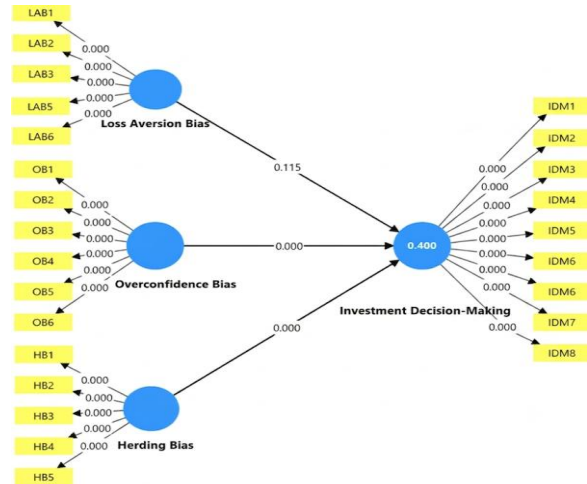


Figure 3: Structural model assessment

PLS-Predict

Assessing Predictive Relevance Using PLS-Predict
To evaluate the out-of-sample predictive power of the endogenous construct, we employed the PLS-Predict approach (Shmueli et al., 2019), which compares the prediction errors of the PLS-SEM model with those of a naive linear benchmark model (LM). This method is particularly valuable for assessing whether the theoretical relationships in the model translate into practical predictive capability.

Moderate Predictive Performance for Investment Decision-Making

As shown in Table 4.7, the analysis indicates moderate predictive power for the Investment Decision-Making construct. A majority of the indicators associated with this construct (specifically IDM1, IDM4, IDM5, IDM6, and IDM7) yielded lower Root Mean Squared Error (RMSE) values in the PLS-SEM model compared to the naive linear model (LM). However, a minority of indicators (IDM2 and IDM3) exhibited slightly higher RMSE values when benchmarked against the linear model. According to the established guidelines by Shmueli et al. (2019), when the PLS-SEM analysis produces lower prediction errors for a majority, but not all, of the indicators, the model is considered to possess moderate predictive power.

While still contributing meaningfully to prediction, this moderate performance implies that the current PLS-SEM specification captures significant predictive patterns, but there may be room for structural refinements. The inclusion of additional explanatory variables, context-specific controls, or moderating factors might be necessary to further strengthen predictive validity and achieve superior performance across all indicators, beyond what a simple linear regression could achieve.

Table 4.7: PLS-Predict

Construct	Items	PLS- RMSE	MAE	LM- RMSE	MAE	PLS- LM RMSE	MAE	Q ² Predict	Predict Power
Investment Decision- Making	IDM1	0.801	0.594	0.847	0.555	1.052	0.826	0.420	Moderate
	IDM2	0.650	0.531	0.548	0.380	0.872	0.663	0.444	
	IDM3	0.697	0.524	0.638	0.439	0.929	0.692	0.438	
	IDM4	1.027	0.760	1.070	0.783	1.145	0.938	0.195	
	IDM5	0.708	0.538	0.742	0.541	0.890	0.655	0.366	
	IDM6	0.705	0.556	0.723	0.541	0.898	0.669	0.383	
	IDM7	0.772	0.626	0.775	0.570	0.960	0.726	0.353	

CONCLUSION

This study examined the associations between loss aversion, overconfidence, and herding biases and investment decision-making among retail investors in Sabah. The findings revealed that loss aversion bias and overconfidence bias were not significantly associated with investment decision-making. In contrast, herding bias exhibited a significant positive association with investment decision-making, although the effect size was relatively small.

The findings suggest that behavioural biases are not equally associated with investment decision-making among investors in Sabah. Specifically, investors who place greater reliance on social information and others' actions tend to report higher levels of engagement in investment-related decision-making. These findings contribute significantly to the behavioural finance literature by offering nuanced refinement to Prospect Theory and Social Learning Theory. Specifically, the insignificance of loss aversion and overconfidence suggests that traditional cognitive-emotional heuristics may be suppressed or mediated by broader environmental or structural factors in less developed regional markets. Conversely, the prominent role of herding bias supports Social Learning Theory, confirming that retail investors in low-penetration financial ecosystems prioritize collective social signals over independent analytical evaluation under market uncertainty. The study also offers practical insights for financial institutions, regulators, and investor education providers seeking to support more informed investment participation among retail investors in Sabah.

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