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The Role of Risk Tolerance in Linking Psychological Biases and Financial Literacy to Gen Z Stock Trading Frequency

M Zaenal Efendi*[1], Fitriyah[2]

[1, 2] Universitas Islam Negeri Maulana Malik Ibrahim Malang, Indonesia

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ABSTRACT

Positioning risk tolerance as a mediating variable, this study investigates the extent to which overconfidence, optimism bias, and financial literacy shape stock trading frequency among Generation Z investors in Malang City. A quantitative approach with an explanatory design was employed, with purposive sampling used to select 100 respondents. Data were gathered through a questionnaire instrument and subsequently analyzed using SmartPLS 4.0 software via SEM-PLS method. The results indicate that overconfidence, optimism bias, and financial literacy all bear a positive and significant influence on risk tolerance. Interestingly, not one of these three variables was found to produce a direct effect on stock trading frequency. Risk tolerance was demonstrated to serve as a full mediator in the relationship between the independent and dependent variables, while at the same time yielding a significant positive effect on trading frequency. These findings point to the conclusion that the trading behavior of Generation Z investors in Malang City is governed far more by their individual level of risk tolerance than by psychological or cognitive factors operating in isolation.

Corresponding Author:

M. Zaenal Efendi
Faculty of Economics, Maulana Malik Ibrahim State Islamic University, Malang, Indonesia
Jalan Gajayana No. 50, Dinoyo, Kota Malang, Jawa Timur 65144
Email: *fenditimang71@gmail.com

1. Introduction

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The global stock market has shown rapid expansion over the past ten years. The increase has been accompanied by a surge in retail investor participation made possible by the penetration of digital technology and the ease of access to investment platforms. In 2024, global stock market capitalization even surpassed USD 123 trillion, marking the highest record in history (Goldstein 2024). A similar dynamic is also seen in Indonesia. By the end of December 2024, the number of Single Investor Identification (SID) reached 14.84 million, up from 12.16 million the previous year. This growth is primarily supported by individual stock investors (Antara 2024; KSEI 2025).

Millennials and Generation Z currently make up the majority of Indonesian investors. The younger age group contributes to more than half of the rise in investors, with 54.12% of Gen Z investors participating in the Indonesian capital market (KSEI 2025; Situmorang 2024). In a comparable context, research centered on Generation Z investors in Malang City also indicates that young individuals in this area are becoming increasingly interested in various types of investment, including those with environmental considerations, influenced by internal factors such as attitudes and investment knowledge (Nilasari and Fitriyah 2024). The expansion of the investor base is closely tied to a broader improvement in public financial literacy. According to the 2025 National Survey on Financial Literacy and Inclusion (SNLIK), financial inclusion reached 80.51% while the financial literacy index stood at 66.46% both figures marking a notable increase compared to the previous year, when the financial literacy index was 65.43% and financial inclusion was 75.02% (OJK and BPS 2025). This condition encourages more individuals, especially the younger generation to engage in investment activities in the capital market.

In line with the growth in the number of investors, stock trading activity has also shown a significant increase. The trading frequency can illustrate how intensely investors conduct transactions in response to various market information (Du and Zhu 2017). In Indonesia, the trend of daily trading activity continues to increase, marked by an average of over one million transactions per day and a growing number of active investors (Wiguna

2024). This fact confirms that individual investors have a significant contribution in shaping the dynamics of the capital market.

However, the high trading intensity is not always based on rational considerations. In the perspective of behavioral finance, investment decisions are often influenced by various psychological biases that can trigger irrational behavior (Barberis and Thaler 2003; Kahneman 2011). One of the dominant biases is overconfidence, which is the tendency of individuals to have excessive confidence in their capacity to forecast changes in the market (Walters and Fernbach 2021). Investors who experience overconfidence generally make transactions more frequently, although this frequency does not always correlate with an improvement in portfolio performance (Barber and Odean 2001; Forman and Horton 2019). This trend is particularly relevant among Gen Z investors, who have grown up in a digital environment with easy access to real-time market information and social media platforms. The abundance of available information can reinforce overconfidence, leading young investors to overestimate their ability to interpret market signals and make more active trading decisions (Rosdiana et al. 2026). Consequently, this overconfidence may lead Gen Z investors to trade stocks more frequently, driven by the belief that their market assessments are superior despite their limited investment experience.

In addition, optimism bias also influences investor behavior. Individuals with excessive optimism tend to ignore risks and have overly high expectations regarding potential investment returns (Khan, Siow-Hooi, and Lee-Lee 2016). Meanwhile, financial literacy serves as a cognitive aspect that helps investors understand risks and make more rational decisions (Lusardi and Mitchell 2013). However, because it could combine with psychological biases, a high degree of financial literacy does not necessarily guarantee good investment behavior, as it can interact with psychological biases (Jain and Kesari 2023). The presence of risk tolerance adds a layer of complexity to the interplay between psychological factors and trading behavior. As a construct, risk tolerance captures the degree to which individuals are prepared to embrace uncertainty and absorb potential losses in their

investment activities (Pak and Mahmood 2015). In this regard, risk tolerance operates as a psychological mechanism that mediates the influence of both psychological and cognitive biases on investment behavior including, most notably, the determination of how frequently an individual engages in trading (Shafqat and Malik 2021).

Despite a considerable body of research exploring the influence of overconfidence, optimism bias, and financial literacy on investment behavior, the results across studies have yet to converge on a consistent conclusion. Several studies have found that overconfidence and optimism bias can increase trading frequency (Antonelli-Filho et al. 2020; Khan et al. 2016), while other research shows different or insignificant results (Cueva et al. 2019; Rashid, Tariq, and Rehman 2022). The same is true for financial literacy, where its influence on trading activity is still a subject of debate among academics (Hangoba and Marvin 2025; Sivaramakrishnan, Srivastava, and Rastogi 2017).

Furthermore, research that specifically incorporates risk tolerance as a mediating variable in the relationship between psychological biases and trading frequency remains limited, particularly among Gen Z investors in Indonesia. From a psychological perspective, Gen Z has been empirically identified as a group with lower risk tolerance compared to previous generations, a disposition shaped by their experience of entering adulthood amid economic uncertainty and high market volatility (Marjerison, Dong, and Kim 2025). Paradoxically, this generally cautious risk orientation does not necessarily suppress trading frequency. Instead, psychological biases such as overconfidence and the optimism bias have the potential to obscure rational risk assessment, thereby distorting Gen Z investors' perception of risk tolerance and ultimately driving more frequent trading behavior (Rosdiana et al. 2026). It is precisely this tension between low dispositional risk tolerance and trading activity driven by psychological biases that positions risk tolerance as a theoretically meaningful mediating variable in understanding Gen Z's stock trading behavior in the Indonesian capital market.

Against this backdrop, the present study seeks to investigate how overconfidence, optimism bias, and financial literacy affect stock trading frequency on Generation Z investors in Malang City as the study population and risk tolerance positioned as the mediating variable. Beyond contributing empirically, this research holds the broader ambition of improving the quality of investment decision-making for both investors and regulators, while at the same time enriching the theoretical foundations of behavioral finance literature.

The Correlation Among Overconfidence and Stock Trading Frequency

Within the framework of Behavioral Finance Theory, overconfidence is identified as a cognitive bias whereby individuals systematically overestimate their own analytical capabilities, the reliability of the information at hand, and the degree of control they hold over investment outcomes (Barber and Odean 2001). Investors do not always process information objectively. Conversely, they often use heuristics that have the potential to cause perceptual distortions (Barberis and Thaler 2003). This bias can manifest in the form of overestimation of personal competence, overprecision regarding prediction accuracy, or illusion of control over market dynamics that are actually full of uncertainty (Khan, Tan, and Chong 2019).

Regarding the stock market, this overconfidence leads investors to believe they have the ability to predict the market accurately. This perception is then translated into action in the form of increased excessive buying and selling activity of stocks. Several studies show Overconfident investors typically engage in more frequent trading than those who are more realistic (Barber and Odean 2001). The phenomenon of excessive trading that arises does not always result in optimal portfolio performance. in reality, net returns can be eroded by transaction costs due to the high volume of trades (Bregu 2020). This is consistent with the research by Nair and Shiva (2023), Antonelli-Filho et al. (2020), and Bao and Li (2020) that overconfidence influence the frequency of stock trading. Conceptually, a greater degree of overconfidence corresponds to a stronger inclination to trade with increasing frequency.

H1: Overconfidence has a positive and significant impact on stock trading frequency.

The Correlation Among Optimism Bias and Stock Trading Frequency

Optimism bias describes people's propensity to predict the future more positively compared to the available objective probabilitie (Scheier and Carver 1985; Sharot 2011). In behavioral finance, this bias is considered a distortion of expectations that influences investors' assessments of risk and potential returns. Optimistic investors tend to see greater chances of profit and relatively smaller chances of loss. Optimism bias is divided into two main forms that is dispositional optimism and situational optimism. Dispositional optimism reflects a deeply held, long-term belief that positive outcomes are more probable than negative ones, whereas situational optimism represents a temporary psychological response triggered by specific external circumstances (Puri and Robinson 2007).

An optimism can increase the willingness to make investment decisions because risks are perceived as more manageable (Rashid et al. 2022). In volatile market conditions, investors with high optimism bias often see volatility as an opportunity. Empirical findings indicate that optimism bias is associated with increased trading activity due to high return expectations (Khan et al. 2016). This finding is further corroborated by Walters and Fernbach which shows that investors with a optimism bias in remembering the past tend to engage in excessive trading (Walters and Fernbach 2021). Optimism bias drives Generation Z investors to overestimate the potential returns of their investment decisions while simultaneously underestimating the associated risks. Reinforced by real-time access to market information and social media-driven investment narratives, this bias sustains an optimistic conviction that compels Gen Z investors to execute transactions more frequently in pursuit of anticipated favorable market outcomes.

H2: Optimism bias has a positive and significant impact on stock trading frequency.

The Correlation Among Financial Literacy and Stock Trading Frequency

The Cognitive Experiential Self Theory (CEST) advanced by Epstein, holds that human behavior is concurrently governed by two separate information processing systems namely the rational system and the experiential system (Epstein 1990). Financial literacy in

this context, represents an individual's ability to comprehend and apply financial concepts within economic decision-making, thereby strengthening the rational dimension of that process. Investors who hold a solid understanding of risk, diversification, and transaction costs are generally more methodical when it comes to evaluating their investment choices (Lusardi and Mitchell 2013).

Prior studies have found that financial literacy is linked to greater engagement in the stock market as well as a notable improvement in the overall quality of investment decisions made by individuals (Sivaramakrishnan et al. 2017). This trend is similarly reflected in local research, where investment knowledge an essential component of financial literacy has been shown to have a significant positive influence on Generation Z's investment interest in Malang City (Nilasari and Fitriyah 2024), further supporting the view that financial literacy serves as an important precursor to investment engagement among young investors. Financially literate investors can read opportunities while also anticipating risks in a more measured way. However, a good understanding can also curb the tendency for excessive trading due to awareness of costs and long-term risks (Hangoba and Marvin 2025). In the context of the younger generation accustomed to digital platforms, financial literacy can increase confidence in transactions, although its impact on trading frequency is not always proportional (Acharya and Hamal 2022).

H3: Financial literacy has a positive and significant impact on stock trading frequency.

The Correlation Among Risk Tolerance and Stock Trading Frequency

Risk tolerance denotes the degree to which individuals are prepared to embrace risk and absorb potential losses when navigating investment decisions (Nosita et al. 2017). Within the framework of modern portfolio theory, risk tolerance serves as a determining factor in shaping asset composition and overall investment strategy. In behavioral finance, on the other hand, risk tolerance is regarded as a psychological construct that governs how an individual responds to fluctuations in the market (Duy Bui et al. 2021).

In general, investors have a high risk tolerance feel more comfortable facing price fluctuations and tend to be more active in trading (Kourtidis, Chatzoglou, and Sevic 2017). People who have a high tolerance level typically employ leverage, select high-risk investments, and make purchases and sales more frequently and swiftly. Conversely, people who have a low risk tolerance prefer to maintain their portfolios and avoid high trading frequency (Pertiwi, Yuniningsih, and Anwar 2019). It is therefore risk tolerance that stands out as a decisive factor in explaining the differing levels of transaction intensity seen among individual investors.

H4: Risk tolerance has a positive and significant impact on stock trading frequency.

The Role of Mediation in Risk Tolerance

A substantial body of empirical literature has consistently documented the connection between overconfidence and trading frequency. Investors who exhibit overconfidence tend to place excessive faith in the precision of their own information while simultaneously underestimating potential losses a disposition that naturally drives up trading frequency (Barber and Odean 2001; Odean 1999). Evidence from developed markets further corroborates this pattern, showing that overconfidence bears a positive relationship with both the intensity of trading and the scale of investment positions taken (Antonelli-Filho et al. 2020; Forman and Horton 2019). That said, certain studies draw a more nuanced conclusion, arguing that the surge in trading activity is better attributed to a shift toward more aggressive risk tolerance rather than overconfidence acting as a direct driver (Khan et al. 2019)..

Regarding optimism bias, individuals with overly positive outcome expectations tend to underestimate the probability of loss (Sharot 2011). Excessive optimism is related to the readiness to take on financial risks and the tendency to engage in more active transactions (Dawson 2023; Puri and Robinson 2007). Empirical studies show that more optimistic investors have a higher tolerance take risk and demonstrate more intensive market participation (Khan et al. 2016).

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Unlike psychological biases, financial literacy represents the rational cognitive capacity to understand the correlation between return and risk. Previous research demonstrates that financial literacy is a critical factor in promoting more informed investment behavior (Atkinson, A., & Messy 2012; Lusardi and Mitchell 2013). Investors equipped with strong financial literacy tend to possess a more precise grasp of their own risk profiles and a clearer awareness of the consequences that investment decisions may carry. Extending this line of inquiry, earlier studies have identified a substantive relationship between financial literacy, active investment engagement, and the degree of risk tolerance an individual possesses (Song et al. 2023; Sutejo 2025).

H5: Overconfidence has a positive effect on stock trading frequency by mediating risk tolerance.

H6: Optimism bias has a positive effect on stock trading frequency by mediating risk tolerance.

H7: Financial literacy has a positive effect on stock trading frequency by mediating risk tolerance.

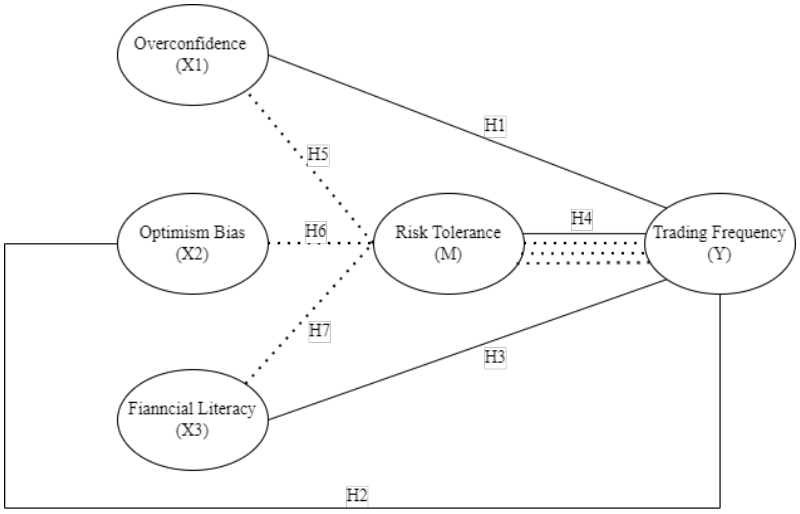

Figure 1. Research Conceptual Framework

2. Methods

This study uses an explanatory type of quantitative methodology (Sugiyono 2016). The research population includes Generation Z stock investors residing in the city of Malang. In this context, Generation Z refers to individuals born between 1997 and 2012 who have securities accounts and are actively trading stocks. The selection of this group is based on the increasing participation of young investors in the capital market and their relatively adaptive investment behavior toward technology and the flow of digital information (Situmorang 2024).

Purposive sampling with non-probability sampling is the sampling methodology applied. This approach was chosen because respondents must fulfill particular requirements in order to support the objectives of the study (Sugiyono 2016). The criteria include: (1) Generation Z, (2) residing in the city of Malang, and (3) doing stock transactions (buy/sell) 3-4 times a year. The sample size was set at 100 respondents based on methodological considerations using the Lemeshow formula. This formula calculates the required sample size in cases where the total population size is not precisely determined (Riyanto and Hatmawan 2020). The formula used is as follows:

$$n = \frac{Z^2.\ P(1-P)}{d^2} \quad \text{.....(1)}$$

Notes:

n = sample size

Z = standard score at a 95% confidence level (1.96)

P = upper bound of the population proportion (0.5)

d = sampling error or alpha of 10% (0.10)

Based on that formula, the sample size is calculated as follows:

$$n = \frac{1{,}96^2 \cdot 0{,}5(1-0{,}5)}{0{,}1^2} \quad \text{.....(2)}$$

$$n = \frac{3{,}4816 \cdot 0{,}25}{0{,}01} \quad \text{.....(3)}$$

$$n = 96{,}4 \quad \text{.....(4)}$$

The calculations indicate that the minimum sample size required for this study is 96 respondents. To simplify data analysis and enhance the study's validity, the sample size was subsequently rounded up to 100 respondents. With that number, the parameter estimates are expected to be stable, and mediation testing using bootstrapping can be conducted effectively. The primary data used in this study were gathered directly from qualified respondents via the dissemination of online questionnaires. Every item contained within the research instrument was assessed using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), applied uniformly across both the independent and mediating variables. The dependent variable, by contrast, was captured using an ordinal scale centered on the question "How often do you buy and sell stocks?" with response options ranging from 1 ("occasionally") to 5 ("more than once a week"), passing through quarterly, monthly, and weekly intervals in between.

For data analysis, Partial Least Squares Structural Equation Modeling (PLS-SEM) was applied through SmartPLS 4.0 software (Hair et al. 2022). This analytical approach was chosen for several reasons: its compatibility with models involving mediating variables, its adequacy for moderate sample sizes, and its independence from the normality assumption. The analytical procedure unfolded across multiple stages, beginning with construct validity and reliability testing as part of measurement model evaluation. Two benchmarks were applied in assessing convergent validity: an Average Variance Extracted (AVE) value of no less than 0.50 and an outer loading value of at least 0.70. Discriminant validity was examined through a combination of cross-loading analysis and the Fornell-Larcker criterion. To maintain measurement consistency, construct reliability was verified against a Cronbach's alpha minimum of 0.60 and a composite reliability minimum of 0.70 (Hair et al. 2022).

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The structural model evaluation then proceeded, employing the R-squared (R^2) value to determine how effectively the independent variables account for variance in the dependent variable, while the predictive relevance value (Q^2) was used to gauge the model's overall capacity for prediction. Hypothesis testing was then conducted by examining path coefficient values, where a T-statistic above 1.96 paired with a p-value below 0.05 served as the threshold for statistical significance (Hair et al. 2022). Mediation analysis is then carried out to ascertain the extent to which risk tolerance functions as a mediating variable within the relationship between the independent and dependent variables. The indirect effect was analyzed thru the indirect effect test. A mediation is considered significant if it achieves the established statistical requirements and is equal to the path coefficient value. Furthermore, the types of mediation are classified into full mediation, partial mediation, or no mediation at all (Abdillah and Hartono 2015).

3. Results

Descriptive Statistics

This research involves 100 respondents who are stock investors from the Gen Z demographic in Malang City. The characteristics of the respondents were analyzed based on several aspects, namely gender, employment status, and the intensity of stock trading activities over the past year.

Table 1. Descriptive Statistic

Personal Demography	Indicator	Frequency	Percentage
Gender	Male	73	73%
	Female	27	27%
	Total	100	100%
Job Status	Student	49	49%
	Entrepreneur	17	17%
	Employee	27	27%
	Unemployed	6	6%

	Freelancer	1	1%
	Total	100	100%
trading within 1 year	3-4 times	48	48%
	>5 times	52	52%
	Total	100	100%

Source: Primary data analyzed by the researcher (2026)

Looking at Table 1, the respondents are predominantly male, with a percentage reaching 73%, while females only account for 27%. This condition indicates that stock investment activities among Generation Z are still more frequently carried out by men, This characteristic is typically associated with increased confidence and greater risk tolerance in the investment decision-making process. If reviewed based on employment status, the majority of respondents are students, accounting for 49%. This is followed by employes at 27%, entrepreneurs at 17%, unemployed at 6%, and freelancers at 1%. The dominance of the student group indicates that Gen Z's involvement in the capital market is increasing, supported by technological advancements and improved financial literacy among them.

Meanwhile, from the stock trading activities over the past year, 73% of respondents were recorded to have made more than five transactions in a year, while the remaining 27% made three to four transactions. This indicates that the majority of respondents can be categorized as fairly active investors in stock trading. Overall, the descriptive statistical results show that the research sample is dominated by students and has a relatively high trading activity level.

Measurement Model Evaluation

Evaluation of the measurement model is conducted to confirm that the indicators employed are capable of validly and reliably representing the intended latent construct. This testing procedure encompasses three principal components: convergent validity, discriminant validity, and construct reliability (Hair et al. 2022).

Table 2. Measurement Model Evaluation Results

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Variable	Item	Indicator	OL	CA	CR	AVE
Overconfidence (X1)	OC1	Accuracy of investment selection	0.906	0.936	0.949	0.726
	OC2		0.711			
	OC3	Confidence in one's abilities and knowledge	0.890			
	0C4		0.809			
	0C5		0.861			
	0C6	Confidence in investment choices	0.865			
	0C7		0.907			
Optimism Bias (X2)	OB1	Relative Success Confidence (Return)	0.927	0.940	0.951	0.737
	OB2		0.923			
	OB3	Belief in Relative Success	0.833			
	OB4		0.812			
	OB5		0.859			
	OB6	Considering the Economic Situation	0.812			
	OB7		0.835			
Financial Literacy (X3)	FL1	Behavior	0.884	0.950	0.958	0.716
	FL2		0.872			
	FL3		0.872			
	FL4	Skills	0.834			
	FL5		0.818			
	FL6	Attitude	0.857			
	FL7		0.820			
	FL8	Knowledge	0.817			
	FL9		0.841			
Risk Tolerance (M)	RT1	Individual Risk-Taking Behavior	0.850	0.933	0.946	0.714
	RT2		0.897			
	RT3		0.863			
	RT4	Aggressive	0.841			
	RT5		0.780			
	RT6	Conservative	0.833			
	RT7		0.845			
Trding Frequency (Y)	TF1	stock trading in 1 year	1			

Source: Primary data analyzed by the researcher (2026)

Convergent validity is evaluated by examining both the outer loading value and the Average Variance Extracted (AVE). An indicator is deemed acceptable when its outer loading value reaches a minimum of 0.70, while a construct is considered to satisfy convergent validity when its AVE value meets or exceeds the threshold of 0.50 (Hair et al.

2022). The analysis results based on Table 2 indicate that all indicators for each variable have met the established minimum threshold, with outer loading values above 0.70. On the overconfidence variable (X1) shows values range from 0.711 to 0.907. Meanwhile, the optimism bias variable (X2) shows values between 0.812 and 0.927. The financial literacy variable (X3) has a value range from 0.817 to 0.884, while risk tolerance (M) is located within the range of 0.780 to 0.897. AVE values across all constructs likewise meet the required threshold. Specifically, the overconfidence variable yields an AVE of 0.726, optimism bias 0.737, financial literacy 0.716, and risk tolerance 0.714. Taken together, these figures confirm that every construct examined in this study satisfies the criteria for convergent validity.

Table 3. Fornell-Larcker Criterion and HTMT Result

	TF	**OB**	**OC**	**RT**	**TF**
Fornell-Larcker Criterion:					
Financial Literacy (FL)	0.846				
Optimism Bias (OB)	0.207	0.859			
Overconfidence (OC)	0.219	0.225	0.852		
Risk Tolerance (RT)	0.536	0.541	0.589	0.845	
Trading Frequency (TF)	0.542	0.442	0.533	0.822	1.000
Heterotrait-Monotrait Ratio (HTMT):					
Financial Literacy (FL)					
Optimism Bias (OB)	0.216				
Overconfidence (OC)	0.232	0.236			
Risk Tolerance (RT)	0.565	0.573	0.629		
Trading Frequency (TF)	0.552	0.456	0.551	0.849	

Source: Primary data analyzed by the researcher (2026)

Discriminant validity is concerned with verifying that each construct within a model carries characteristics that are meaningfully distinguishable from those of the other constructs present (Hair et al. 2022). As presented in Table 3, every indicator records its highest loading value on its own corresponding construct. This pattern confirms the absence of overlap

between constructs, allowing each variable to be regarded as possessing a sound level of discriminant validity.

Reliability testing is conducted to examine the degree of internal consistency among the indicators measuring each construct, with both Cronbach's Alpha (CA) and Composite Reliability (CR) values serving as the primary reference points. A construct is deemed reliable when both CA and CR values reach a minimum of 0.70. As reflected in Table 2, all variables demonstrate a high degree of reliability. The overconfidence variable records a CA of 0.936 and a CR of 0.949, while optimism bias yields a CA of 0.940 and a CR of 0.951. Financial literacy returns a CA of 0.950 and a CR of 0.958, and risk tolerance presents a CA of 0.933 alongside a CR of 0.946. Taken as a whole, these values affirm that every construct demonstrates robust internal consistency and is adequately suited for measuring its corresponding variable.

The comprehensive evaluation of the measurement model confirms that all indicators and constructs examined in this study meet the required validity and reliability standards. The measurement model is consequently deemed fit for purpose, allowing the analysis to advance to the next stage that is the structural model (inner model) assessment, which probes the nature and direction of relationships among the variables under investigation.

Structural Model Evaluation

Structural model evaluation is carried out to determine how well the model captures the relationships between latent variables while simultaneously assessing its predictive capacity. This process unfolds across several sequential steps, encompassing the R-squared (R^2) value, Q-squared (Q^2) value, path coefficient significance, and mediation testing through the Indirect Effect (Hair et al. 2022).

Table 4. R-square (R^2) Result

	R-square	**R-square adjusted**
Risk Tolerance	0.646	0.635

Trading Frequency	0.696	0.684

Source: Primary data analyzed by the researcher (2026)

The R-squared value quantifies the proportion of variance in the dependent variable that is accounted for by the independent variables within the research model (Hair et al. 2022). As shown in Table 4, the risk tolerance variable yields an R-squared value of 0.646 and an adjusted R-squared of 0.635, indicating that approximately 64.6% of its variation is explained by overconfidence, optimism bias, and financial literacy with the remaining portion attributable to factors outside the scope of the model.

The trading frequency variable, meanwhile, produces an R-squared value of 0.696 and an adjusted value of 0.684, meaning that roughly 69.6% of the variation in stock trading frequency is accounted for by the variables incorporated in the model. Based on the criteria applied, both values fall within the moderate to strong range, suggesting that the model carries a reasonable degree of explanatory power.

Table 5. Q-square (Q^2) Result

	Q-square
Trading Frequency	0.600
Risk Tolerance	0.454

Source: Primary data analyzed by the researcher (2026)

The Q-squared value serves as a measure of the model's predictive capability with respect to the variables under examination (Hair et al. 2022). As presented in Table 5, the trading frequency variable returns a Q-squared value of 0.600, while risk tolerance yields a value of 0.454. Both figures comfortably surpass the minimum threshold of 0.02, affirming that the model possesses a strong level of predictive relevance. The model, therefore, not only effectively illustrates the relationships among variables but also demonstrates reliable predictive accuracy with respect to the observed phenomena.

Table 6. Path Coefficient Result

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	Original sample	Sample mean	Standard deviation	T statistics	P values
OC -> RT	0.425	0.422	0.095	4.462	0.000
OC -> TF	0.102	0.093	0.130	0.788	0.431
OB -> RT	0.369	0.359	0.094	3.918	0.000
OB -> TF	0.029	0.019	0.110	0.260	0.795
FL -> RT	0.366	0.360	0.094	3.885	0.000
FL -> TF	0.160	0.154	0.124	1.289	0.198
RT -> TF	0.660	0.660	0.217	3.045	0.002

Source: Primary data analyzed by the researcher (2026)

Path coefficient testing was conducted to establish both the direction and the significance of relationships between variables within the model (Hair et al. 2022). As reflected in Table 6, overconfidence is found to exert a positive and significant effect on risk tolerance (β: 0.425 | t: 4.462 | p: 0.000). In a similar vein, optimism bias demonstrates a positive and significant influence on risk tolerance (β: 0.369 | t: 3.918 | p: 0.000), as does financial literacy (β: 0.366 | t: 3.885 | p: 0.000).

When it comes to direct effects on trading frequency, however, none of the three independent variables reach statistical significance. The results for overconfidence (β: 0.102 | t: 0.788 | p: 0.431), optimism bias (β: 0.029 | t: 0.260 | p: 0.795), and financial literacy (β: 0.160 | t: 1.289 | p: 0.198) all fall short of the required significance criteria. Consequently, the hypotheses asserting that overconfidence (H1), optimism bias (H2), and financial literacy (H3) each significantly affect stock trading frequency are rejected. Risk tolerance, by contrast, proves to be a positive and significant predictor of trading frequency (β = 0.660; t = 3.045; p = 0.002). This finding implies that investors who possess a greater capacity for risk tolerance are inclined to engage in stock trading with heightened intensity. On these grounds, the hypothesis (H4) positing that risk tolerance has a positive and significant impact on stock trading frequency is well-founded.

Table 7. Indirect Effect Result

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	Original sample	Sample mean	Standard deviation	T statistics	P values
OC -> RT -> TF	0.281	0.281	0.118	2.373	0.018
OB -> RT -> TF	0.244	0.244	0.114	2.138	0.033
FL -> RT -> TF	0.242	0.242	0.108	2.232	0.026

Source: Primary data analyzed by the researcher (2026)

Mediation analysis was carried out to evaluate the role of risk tolerance as a mediating variable in the relationship between the independent variables and trading frequency, relying on indirect effect values derived from path coefficients, T-statistics, and p-values. As presented in Table 7, the indirect effect of overconfidence on trading frequency through risk tolerance is both positive and statistically significant (β: 0.281 | t: 2.373 | p: 0.018). Comparably significant indirect effects are likewise observed for optimism bias (β: 0.244 | t: 2.138 | p: 0.033) and financial literacy (β: 0.242 | t: 2.232 | p: 0.026). These results support the acceptance of the hypotheses that overconfidence (H5), optimism bias (H6), and financial literacy (H7) each influence stock trading frequency through the mediating role of risk tolerance.

Given that the direct effects of the independent variables on trading frequency are statistically insignificant while their indirect effects through risk tolerance are significant, the evidence points to full mediation. In other words, risk tolerance fully mediates the relationship between overconfidence, optimism bias, and financial literacy on stock trading frequency. What this ultimately suggests is that psychological and cognitive factors do not bear directly on stock trading behavior. These findings indicate that psychological and cognitive factors do not directly influence stock trading behavior. However, this influence works via the way investors understand, evaluate, and respond to risks in investment activities, which in the end determines the intensity of stock trading conducted.

4. Discussion

The Influence of Overconfidence on Stock Trading Frequency

Table 6 indicates that the first hypothesis (H1) is rejected. Overconfidence does not influence stock trading frequency. These findings indicate that elevated investor confidence does not directly lead to increased stock trading frequency. In other words, although investors feel confident in their analytical abilities and investment knowledge, that confidence does not always manifest in the form of more frequent transaction decisions in the capital market. These findings align with previous studies indicating that trading behavior is not always directly influenced by overconfidence, particularly among investors who are in the early stages of capital market experience (Cueva et al. 2019; Khan et al. 2016). In this context, overconfidence tends to be a potential psychological bias that remains within the investor and has not yet fully developed into actual actions taken in market activities.

Theoretically in the study of behavioral finance, overconfidence is often associated with the tendency of overtrading that may negatively impact investors (Barber and Odean 2001; Ricciardi and Simon 2000). However, the findings of this investigation indicate that the there is no absolute relationship, but can be influenced by the specific characteristics of the group of investors being studied. Based on the Cognitive Experiential Self Theory (CEST), overconfidence originates from an experiential system that is intuitive in itself, but investment decisions remain under the control of a more analytical and structured rational system (Epstein 1990). Although Generation Z is often characterized by high self-confidence and rapid decision-making, this does not necessarily lead to higher stock trading frequency because most Gen Z investors remain cautious about potential losses and capital constraints. Their confidence tends to remain at the cognitive level, while actual trading decisions are still shaped by rational evaluation and readiness to face investment risk (Khan et al. 2016). This explains why Gen Z investors still consider their options before making investment decisions.

The Influence of Optimism Bias on Stock Trading Frequency

Table 6 indicates that the second hypothesis is not supported. Optimism bias does not influence stock trading frequency. Therefore, H2 is rejected. These results indicate that positive expectations regarding market conditions do not directly encourage investors to increase their trading activities. These findings indicate that Gen Z investors are able to maintain a balance in managing their optimism, so it does not immediately turn into impulsive actions. This finding is consistent with Dhaoui and Khraief (2014), who found that optimism sentiment has an insignificant short-term impact on stock trading volume. Similarly, Pratiwi and Hariyanto (2024) found that optimism bias does not significantly influence stock investment decisions among Indonesian investors, suggesting that optimistic tendencies alone may not be sufficient to drive more frequent trading activity. In this context, although investors have high expectations regarding potential profits, they still consider various risks before making investment decisions.

In the realm of behavioral finance, optimism bias describes the inclination of individuals to inflate their perceived probability of success while simultaneously downplaying the risks that accompany their decisions (Khan et al. 2016; Sharot 2011). However, in this study, the bias does not directly trigger an increase in trading activity, but is influenced by other factors (Rashid et al. 2022). Based on CEST, optimism bias resulting from the experiential system still requires validation from the rational system before it can be implemented in the form of action (Epstein 1990). Therefore, optimism bias primarily shapes perception rather than directly influencing behavior. New trading activity will increase when that optimism is supported by individuals' readiness to face investment risks (Kahneman 2011).

The Influence of Financial Literacy on Stock Trading Frequency

The third hypothesis also was not given empirical support. Financial literacy does not influence on stock trading frequency, so H3 is rejected. These results indicate that a higher level of financial literacy does not automatically translate into a proportional rise in trading activity. The knowledge they possess actually motivates them to improve the quality of their

decisions, rather than in the form of trading frequency. so that investment activities become more planned (Hangoba and Marvin 2025; Rida et al. 2024). These findings are consistent with previous research, which indicates that financial literacy does not have a significant effect on investor participation in stock trading (Hangoba and Marvin 2025). This phenomenon may be attributed to the tendency of investors with high financial literacy to exhibit greater selectivity and caution in their decision-making processes.

Financial literacy constitutes an element of human capital that improves individuals' capacity to analyze financial instruments (Lusardi and Mitchell 2013). However, high literacy also increases awareness of risks and transaction costs. In the CEST framework, financial literacy serves as part of a rational system that controls emotional impulses in trading activities (Epstein 1990). In this study, financial literacy is more accurately conceptualized as a mechanism for regulating investor behavior, rather than as a factor that increases trading frequency.

The Influence of Risk Tolerance on Stock Trading Frequency

Empirical evidence lends support to the fourth hypothesis. Risk tolerance is shown to exert a positive and significant effect on stock trading frequency, leading to the acceptance of H4. These results strengthen the view that risk tolerance functions as a fundamental driver of trading behavior. Investors who are more comfortable with risk tend to be markedly more active participants in the market, given their greater capacity to weather volatility and capitalize on emerging investment opportunities with relative ease. This outcome is further consistent with prior research establishing a positive relationship between risk tolerance and stock trading frequency (Duy Bui et al. 2021; Kourtidis et al. 2017).

According to behavioral finance theory, risk tolerance is positioned as a risk preference that serves as a primary determinant in explaining differences in investment behavior among individuals (Shefrin and Statman 2000; Slovic 2000). In the CEST framework, risk tolerance results from the integration of rational and experiential systems, which together influence an individual's readiness to act under conditions of uncertainty

(Epstein 1990). This combination results in a state of readiness to act in uncertain market situations. In this context, Higher levels of risk tolerance among Gen Z investors are associated with increased stock trading frequency.

The Effect of Overconfidence on Stock Trading Frequency, with Risk Tolerance as a Mediator

Empirical evidence supports the fifth hypothesis, confirming that overconfidence influences stock trading frequency through the mediating role of risk tolerance, thereby leading to the acceptance of H5. This finding establishes that overconfidence does not bear directly on trading behavior; instead, its effect is channeled through an elevation in risk tolerance. The implication is straightforward high levels of confidence will only translate into behavioral change when accompanied by a genuine readiness to confront the risks inherent in investment activities. This finding is in line with prior studies that have shown the effect of overconfidence on investment behavior to be channeled through risk tolerance, which operates as the underlying mediating mechanism (Khan et al. 2019).

According to Prospect Theory, investment decisions are primarily influenced by risk perception rather than by expected gains alone (Kahneman and Tversky 1979). Therefore, risk tolerance functions as a mechanism that transforms overconfidence into tangible actions in stock trading. In this context, the higher the overconfidence bias, it does not directly increase the frequency of stock trading, but it will increase a risk tolerance which will drive Gen Z investors in Malang City to engage in more frequent stock trading.

The Effect of Optimism Bias on Stock Trading Frequency, with Risk Tolerance as a Mediator

As indicated in Table 6, the sixth hypothesis finds empirical support. Risk tolerance is confirmed to fully mediate the relationship between optimism bias and stock trading frequency. Therefore, H6 is accepted. This indicates that optimism toward the market is not enough to drive trading activity without the readiness to face risks. These findings highlight

the difference between expectations and the realization of actions in investment behavior. Optimism bias shapes expectations, while risk tolerance determines whether those expectations will be realized in the form of investment decisions (Dawson 2023; Kahneman 2011).

From a theoretical perspective, these findings confirm the fundamental difference between expectations and the realization of actions in investment behavior. Optimism bias functions in shaping a positive orientation of investors toward the market. But within the CEST framework, biases resulting from the experiential system still require confirmation from the rational system before being manifested in actions (Epstein 1990). Therefore, efforts that focus solely on fostering an optimistic attitude without increasing risk tolerance tend to be less effective in encouraging active investor participation in the capital market. In this context, the higher the optimism bias, it does not directly increase the frequency of stock trading, but it will increase a risk tolerance which will drive Gen Z investors in Malang City to engage in more frequent stock trading.

The Effect of Financial Literacy on Stock Trading Frequency, with Risk Tolerance as a Mediator

As reflected in Table 6, the seventh hypothesis (H7) receives empirical support. Financial literacy is found to influence stock trading frequency through the mediating role of risk tolerance. This suggests that a strong command of financial knowledge does not inherently translate into greater trading frequency such an effect only materializes when paired with the investor's willingness to assume risk. In other words, financial knowledge primarily contributes to developing a realistic understanding of risk, which subsequently enhances readiness to act, rather than directly increasing trading frequency. This result, in which full mediation is observed, is consistent with prior research suggesting that financial literacy exerts a more pronounced influence on the soundness of investment decisions than on the sheer volume of trading activity (Sutejo 2025).

Conceptually, this finding can be explained via the financial capability framework that differentiates between cognitive and affective dimensions in investment behavior (Lusardi and Mitchell 2013). Financial literacy represents the cognitive aspect in the form of knowledge and analytical ability regarding financial instruments, while risk tolerance reflects the affective aspect related to emotional readiness in the face of uncertainty (Song et al. 2023). According to Cognitive-Experiential Self-Theory (CEST), financial literacy, which is situated within the rational system, requires support from the experiential system in the form of risk tolerance to be effectively translated into tangible actions (Epstein 1990). In this context, the higher the financial literacy, it does not directly increase the frequency of stock trading, but it will increase a risk tolerance which will drive Gen Z investors in Malang City to engage in more frequent stock trading.

The results of this study point to risk tolerance as the principal mediating variable through which cognitive and psychological factors exert their influence on stock trading frequency. Overconfidence, optimism bias, and financial literacy do not exert a direct influence instead, their effects are mediated through risk tolerance as an intermediary mechanism. This outcome aligns with the broader behavioral finance literature, which underscores that investment behavior emerges from the dynamic interplay among psychological factors, cognitive capabilities, and individual risk preferences (Kahneman 2011; Shefrin and Statman 2000). Therefore, this research provides empirical contributions to deepen the understanding of Generation Z investors' behavior, particularly in the increasingly complex and modern dynamics of the capital market.

5. Conclusion

This study concludes that the trading frequency of Generation Z investors in Malang City is not directly influenced by overconfidence, optimism bias, or financial literacy. Rather, these three factors only have a positive impact thru the mediation of risk tolerance. This finding can be understood thru the characteristics of Gen Z as a group that built up in the face

of economic uncertainty, thereby forming a disposition of caution toward risk that serves as a psychological filter before biases or knowledge manifest as actual trading behavior. Thus, risk tolerance is not just a statistical mediating variable, but rather a fundamental psychological gateway that converts perceptions, beliefs, and knowledge into investment actions, making Gen Z's trading behavior more reflective of their readiness to bear risk than their level of confidence or financial knowledge. These findings contribute to the behavioral finance literature by demonstrating that the relationship between psychological and cognitive factors and investment behavior is indirect and highly dependent on the investor's risk disposition.

However, this research has several limitations. this study only focuses on Generation Z investors in the city of Malang, not on all generational groups. Furthermore, the use of variables limited to three main factors does not fully represent the complexity of investor behavioral biases, so there is a possibility that influential biases have not been included in the research model. The survey-based quantitative approach used also has limitations in deeply capturing the cognitive and emotional processes of respondents, which can lead to perception bias. Thus, these limitations are largely methodological, yet they still require careful consideration when interpreting the results. For future research, it is recommended to expand the model with additional bias variables and a longitudinal approach. Meanwhile, for practitioners, the development of risk management capabilities among young investors is considered more strategic than merely improving financial literacy.

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