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The Effect of Financial Literacy, Overconfidence, and Herding Behavior on Application-Based Investment Decisions

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Abstract

Purpose: This study examines the influence of financial literacy, overconfidence, and herding behavior on investment decisions made through digital-based applications. It aims to determine which cognitive and behavioral factors most significantly shape investors' decision-making in the digital era.

Methodology: The research applies a quantitative approach using a survey method involving 400 individual investors in Sumatra, Indonesia, selected through purposive sampling. Data were collected via an online questionnaire and analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0. The analysis covered the outer model (validity and reliability) and the inner model (path coefficients and significance testing).

Results/findings: The results indicate that financial literacy, overconfidence, and herding behavior each have a positive and significant effect on application-based investment decisions. These findings show that knowledge, self-confidence, and social influence play vital roles in shaping investors' behavior in digital investment platforms.

Conclusions: Investors' decisions in digital applications are influenced by both cognitive and social psychological factors, supporting behavioral finance theory, which asserts that investment behavior is not entirely rational.

Limitations: This study is limited to individual investors in Sumatra and uses self-reported data, which may cause response bias. It also excludes external factors such as market volatility, emotional regulation, and platform usability that could affect investment behavior.

Contribution: This research enriches behavioral finance literature by examining financial literacy, overconfidence, and herding behavior together in the context of digital investment platforms in Indonesia, offering new empirical evidence on their combined influence on investment decisions.

Keywords: *Digital Applications, Financial Literacy, Herding Behavior, Investment Decisions, Overconfidence.*

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1. Introduction

Investment is an essential activity in the modern economy that reflects the efforts of individuals and institutions to allocate financial resources into various instruments with the aim of gaining future profits. In general, investment refers to the allocation of a certain amount of funds into specific assets or projects with the expectation of generating income or an increase in value in the future (Zhang, Nazir, Farooqi, & Ishfaq, 2022). Investment is also defined as the postponement of current consumption to be placed

in productive assets over a certain period of time (Chania, Sara, & Sadalia, 2021). In the context of globalization and technological advancement, the forms and instruments of investment continue to evolve, ranging from conventional investments such as stocks and bonds to digital, application-based investments. This development indicates that investment is not solely oriented toward financial gain but also toward efficiency, ease of access, and long-term economic growth potential. In Indonesia, investment trends show a significant increase, particularly among the younger generation. Based on the publication of the Indonesian Central Securities Depository (KSEI), by the end of November 2024, the number of investors in the capital market reached 14.58 million, an increase of 94.87% compared to 7.48 million in 2021. This condition reflects the growing financial awareness of the public and a paradigm shift in investment toward a more modern and technology-based approach in the future.

This growth cannot be separated from the increasing public interest, as people are becoming more active in investing through digital investment applications, supported by effective digital education innovation strategies, according to a press release from the Indonesia Stock Exchange (IDX, 2025). The rise in the number of investors also reflects changes in public behavior toward investment, where access to information and technology plays a crucial role. Theoretically, the concept of investment can be explained through the *Modern Portfolio Theory* Markowitz (2008), which emphasizes the importance of asset diversification to maximize returns at a given level of risk. This theory serves as the foundation for current investment decision-making processes, in which investors consider rationality in balancing risk and return.

Over the past few decades, the development of digital technology has brought significant changes to the world of investment, particularly with the emergence of technology-based financial applications *(financial technology/fintech*). This growth has been driven by the increasing ease of access to financial information and services through investment applications that can be downloaded and used directly via smartphones. In Indonesia, there are various investment applications that offer convenience for the public to invest in the capital market and other financial instruments. Several investment platforms in Indonesia, such as Ajaib, Bibit, Growin', and others, typically provide a range of investment products including stocks, mutual funds, and bonds, which can be accessed anytime and anywhere. Furthermore, features such as educational content, market analysis, and user-friendly interfaces have encouraged people to shift from traditional investment methods to more modern, practical, and affordable digital approaches. This phenomenon reflects a paradigm shift from traditional methods to more contemporary and accessible financial management practices.

Although investment access has become increasingly easier, the quality of decision-making has not necessarily improved. Many investors, particularly application users, remain trapped in irrational decisions due to psychological biases. According to Kahneman and Tversky (2013), individuals are often depicted as satisfaction seekers rather than optimal decision-makers, and it has been postulated that humans do not "naturally" make rational decisions; instead, their decisions tend to be unpredictable and inconsistent (Raut, 2020). Traditional financial theory emphasizes that investors are rational individuals whose investment decisions should be based on knowledge and objective analysis (Fama, 1970). One of the main approaches in behavioral finance is Prospect Theory, developed by Kahneman and Tversky (2013), which asserts that individuals do not always make rational decisions but are often influenced by how information is presented and tend to be more sensitive to losses than to gains. This condition leads investors to follow the behavior of the majority without conducting an in-depth analysis of the risks and potential returns of their investments.

In the context of application-based investing, this phenomenon becomes even more relevant as easy access to information, rapid transaction processes, and exposure to social media can amplify impulsive behavior and psychological biases in investment decision-making. Therefore, the urgency of this study lies in understanding how financial literacy, overconfidence, and herding behavior simultaneously influence application-based investment decisions. Understanding this relationship is crucial to provide empirical contributions that strengthen behavioral finance theory and serve as a foundation for developing digital financial education strategies aimed at improving the quality of investment decision-making among the public in the digital transformation era.

Investment decision, as the dependent variable (Y) in this study, refers to the process by which investors determine the allocation of funds to specific investment instruments while considering potential risks and returns. An investment decision is a series of processes through which an investor—either an individual or a company—collects and makes investment decisions based on available resources, including capital and information (Hidayat & Moin, 2023). Two cognitive biases that often influence investment decisions are overconfidence and herding behavior. Herding behavior occurs when investors tend to follow the majority's decisions without conducting thorough analysis, often driven by limited knowledge, social pressure, or fear of missing market trends (Putra, 2024; Sabir, Mohammad, & Shahar, 2019). This behavior reduces the rationality of decision-making and may disrupt market efficiency. Previous studies (Ahmad & Wu, 2022; Putra, 2024) have shown that herding behavior has a positive and significant effect on investment decisions, indicating that many investors make choices not based on personal analysis but on psychological impulses to imitate market behavior.

Meanwhile, overconfidence describes a condition in which investors have excessive belief in their abilities, thereby underestimating available information, engaging in excessive trading, and taking disproportionate risks (Hidayat & Moin, 2023). This bias not only leads to less rational decisions but may also reinforce herding tendencies when overconfidence in group-formed market perceptions drives investors to follow the majority's actions. Several studies (Almansour, Elkrghli, & Almansour, 2023; Sabir et al., 2019; Seraj, Alzain, & Alshebami, 2022) have confirmed that overconfidence has a positive and significant impact on investment decisions and is related to the rise of herding behavior in the market.

One of the key factors that can encourage investors to make rational decisions is financial literacy. Investors with good financial understanding are more capable of managing risks and comprehending investment products comprehensively, thereby minimizing the likelihood of bias and errors in decision-making. Low financial literacy can lead to information asymmetry that hinders market participation (Raut, 2020). The importance of financial literacy, including its positive externalities such as improved financial decision-making, has been supported by numerous studies (Andreou & Anyfantaki, 2021). However, data from the 2024 National Survey on Financial Literacy and Inclusion (SNLIK), conducted by the Financial Services Authority (OJK) and the Central Statistics Agency (BPS), indicate that Indonesia's financial literacy index stands at 65.43%, which still poses a challenge for making sound investment decisions. This limitation potentially hinders individuals' ability to make accurate and rational investment choices. Although investment accessibility continues to increase, challenges related to financial literacy among Indonesian citizens—particularly in Sumatra—remain an issue of concern. Sumatra has a smaller proportion of investors compared to Java, at only 16.64% of domestic investors in Indonesia, based on OJK data (Yashinta Desy Abigail, 2024).

Application-based investment decisions are influenced by a combination of cognitive and behavioral factors. A good level of financial literacy serves as the fundamental basis for investors to understand risks, assess potential returns, and make rational, information-based investment decisions. However, in practice, many investors remain influenced by psychological biases, particularly overconfidence and herding behavior. Overconfidence arises when investors have excessive belief in their abilities and knowledge, leading them to overlook important information and take disproportionate risks. Meanwhile, herding behavior reflects the tendency of investors to follow the actions of the majority without conducting in-depth analysis of market conditions. These two biases are interrelated, as excessive confidence often reinforces the tendency to imitate group behavior as a form of validation for personal perceptions.

In the context of digital investment, the influence of these three factors becomes even more relevant, as the ease of access to investment applications triggers impulsive behavior due to the rapid flow of information and dynamic market trends. Investors with low levels of financial literacy are more vulnerable to social influence and cognitive biases, which can lead to suboptimal investment decisions. Therefore, this study is crucial to empirically analyze the extent to which financial literacy, overconfidence, and herding behavior affect application-based investment decisions. The findings of this research are expected to contribute to the development of behavioral finance literature and serve as

a foundation for improving financial education and designing strategies for managing investment behavior among the public in the continuously evolving digital era.

2. Literature Review and Hypothesis Development

2.1 Theoretical Basis

The behavioral finance theory emerged as a response to the limitations of traditional financial theory in explaining market anomalies and irrational investor behavior (Almansour et al., 2023). Traditional financial theory assumes that capital markets are efficient and that stock prices reflect all available information, implying that investors always make rational decisions based on complete information (Almansour et al., 2023). However, behavioral finance argues that investment decisions are often influenced by psychological and emotional factors that lead to deviations from rationality (Almansour et al., 2023). Behavioral finance theory also explains that an individual's financial behavior relates to financial responsibility, which includes asset and money management procedures associated with productive financial management practices (Tang & Haryono, 2023).

Prospect Theory, developed by Kahneman and Tversky (2013), explains that when decision outcomes are uncertain, investors tend to focus on potential gains rather than minimizing losses (Zhang et al., 2022). The theory posits that when investors are faced with two options in the securities market—potential gains and potential losses—they tend to choose the option that offers the perception of profit rather than considering the risk of loss. This behavior is linked to investors' tendency to evaluate outcomes through cognitive biases, which ultimately influence investment decision-making (Zhang et al., 2022). Investment decisions are fundamentally based on two core principles: first, knowledge-based investment, known as financial literacy, and second, behavior-based investment decisions. Investment interest driven by a strong foundation of financial literacy will lead to more rational choices (Putra, 2024). Overall, investment decision-making is a complex process influenced by various factors, including financial literacy, overconfidence, and herding behavior.

2.1.1 Financial Literacy

Financial literacyis broadly defined as a combination of knowledge, skills, attitudes, and behaviors that enable individuals to make appropriate financial decisions according to their personal conditions and goals (Council, 2018). It encompasses the ability to understand and apply basic financial concepts such as budgeting, debt management, saving, investing, and long-term financial planning (Investopedia, 2023). Financial literacy plays a crucial role in shaping investors' risk perception (Almansour et al., 2023). Individuals with a high level of financial literacy tend to be more capable of financial planning and making wiser investment decisions, such as saving and preparing for retirement funds. Conversely, low financial literacy can lead individuals to make poor investment decisions, negatively affecting their financial condition (Gilenko & Chernova, 2021; Seraj et al., 2022).

Financial literacy has a strong correlation with how individuals manage their finances (Pramithasari & Wibowo, 2025). Financial literacy refers to the knowledge and skills necessary for individuals to make effective financial decisions. It also includes the ability to understand the function of money, its management, and investment. It represents an accumulation of skills and knowledge that enables individuals to make rational, effective, and resource-appropriate decisions (Andreou & Anyfantaki, 2021; Seraj et al., 2022). The study by Andreou and Anyfantaki (2021) emphasizes that in the digital era, financial literacy must be accompanied by digital competency to effectively utilize digital financial services.

2.1.2 Overconfidence

Overconfidence is defined as an emotional deviation in which an individual feels skilled and knowledgeable enough to make a decision; however, this confidence often exceeds their actual ability, leading investors to overestimate their investment competence (Hidayat & Moin, 2023). In the context of investment, overconfidence refers to an excessive sense of self-assurance that causes investors to overestimate their predictive abilities and underestimate potential risks (Adielyani & Mawardi, 2020). Highly confident investors tend to take greater risks, unlike rational investors who always aim to maximize returns while minimizing risks (Adielyani & Mawardi, 2020).

Individuals with excessive confidence often ignore available evidence in the decision-making process because they are overly convinced that their personal beliefs are absolutely correct. This condition leads them to hold onto their own views even when confronted with contradictory information (Seraj et al., 2022). Past investment experiences and a strong sense of self-confidence play a crucial role in shaping individual behavior and altering investors' mindsets (Sabir et al., 2019). Overconfidence significantly influences how investors process information and assess risks (Almansour et al., 2023).

Overconfident investors tend to believe they possess superior knowledge and abilities compared to reality; therefore, when making predictions about certain events, they treat their estimated outcomes as certainties (Seraj et al., 2022). In this cognitive bias, investors rely heavily on their own knowledge, skills, and judgment (Mahmood, Ayyub, Imran, Naeem, & Abbas, 2020). Such overconfidence behavior affects investment decision-making because it causes investors to overvalue their assessments or underestimate publicly available information, leading to biased and often suboptimal investment behavior (Hidayat & Moin, 2023).

2.1.3 Herding Behavior

Herding behavior, which refers to the tendency of investors to follow the actions of others without considering relevant information, is also a key concept in behavioral finance (Almansour et al., 2023). Herding behavior can be defined as the tendency of individuals to adopt the beliefs, behaviors, or attitudes of the majority within a group, often at the expense of their own judgment or individuality (Santoso, Maulidani, Riduansah, Saiful, & Hakim, 2025). This behavior can lead to asset bubbles and market crashes, as investors collectively buy or sell assets based on emotions and market sentiment rather than on the assets' fundamental values (Almansour et al., 2023). In economics and finance, herding—or herd behavior—refers to a process in which economic agents imitate one another's actions and/or decisions (Sadewo & Cahyaningdyah, 2022). Herding is irrational and has a destabilizing effect on financial markets by pushing asset prices away from their fundamental values, often followed by a reversal in returns (Mavruk, 2022).

In the financial field, herding behavior refers to the tendency of investors to follow or imitate the investment actions of others, often without conducting an in-depth analysis of the available information. Initially, this behavior was observed among groups of animals—such as ducks and birds—that move collectively in the same direction (Putra, 2024). However, this phenomenon also occurs among humans, including in investment decision-making. In practice, many investors engage in irrational actions such as herding behavior when making investment decisions, rather than basing their choices on fundamental analysis and rational judgment (Putra, 2024). Herding behavior, rooted in psychological and zoological literature, refers to imitative behavior, in which individuals reproduce the actions, preferences, and reflections observed from previous actors (Lim, Seetaram, Hosany, & Li, 2023). The essence of herding lies in its evolving nature—it changes and grows over time within a population, especially in decision-making processes, where individuals often end up making the same choices as the group (Lim et al., 2023).

2.1.4 Application-Based Investment Decision

According to Ardini and Achyani, as cited in Hidayat and Moin (2023), an investment decision is a series of processes in which an investor, whether an individual or a corporation, gathers and makes investment choices based on available resources, including capital and information. In a study by Tang and Haryono (2023), referring to Sutrisno, an investment decision is defined as how a financial manager allocates funds into various forms of investment that are expected to generate future profits. The financial manager allocates funds in the form of investments to obtain returns in the future.

Application-based investment refers to investment activities conducted through digital platforms or mobile applications. These platforms enable investors to buy and sell various investment instruments—such as stocks, bonds, and mutual funds—quickly and easily. Application-based investment decisions refer to the process of making financial decisions digitally via mobile-based platforms, covering account registration, instrument selection, transaction placement, and investment portfolio monitoring. In Indonesia, this phenomenon has rapidly grown due to the convenience of electronic Know Your

Customer (e-KYC) procedures, low transaction fees, and the availability of robo-advisors and in-app investor education features. According to the Financial Services Authority (OJK, 2023), digital channels for mutual fund distribution and stock trading must operate under the supervision of official financial institutions to ensure transaction security and transparency. This indicates that application-based investment decisions are influenced not only by individual factors but also by regulation and technological innovation.

Some of the most popular investment applications in Indonesia include Bibit, Ajaib, and Growin'. Bibit is a mutual fund selling agent application (APERD) that provides robo-advisor features to tailor portfolios according to users' risk profiles. It offers both conventional and Sharia mutual fund options, along with automatic top-up services and short educational content within the app (Bibit, 2023). Ajaib offers cross-instrument investment within a single platform, covering stocks, mutual funds, bonds, and even access to global markets (Sitoresmi, 2024). Its advantages include online account opening, integrated in-app research, price alert features, and accessible educational materials (Ajaib, 2023). Meanwhile, Growin', developed by Mandiri Sekuritas, provides integrated digital investment services for stocks, mutual funds, bonds, and Sharia instruments. Its key features include Simple Investing for goal-based product curation, Cutting-edge Stock Chart for technical analysis, and Smart Running Trade to monitor real-time market transactions (Sekuritas, 2023).

From an investor behavior perspective, factors such as app usability, user interface design, and notification features significantly influence transaction intensity and the quality of investment decisions. According to Sabir et al. (2019), financial literacy and trust in digital platforms play an essential role in shaping investor decisions, particularly in reducing behavioral biases such as herding and overconfidence. Another study in Indonesia found that perceived ease of use and trust in system security are key determinants in the adoption of investment applications (Putra, 2024). Therefore, although digital investment applications offer quick access, low costs, and curated information, investor decisions remain heavily influenced by their level of financial literacy and psychological biases.

2.2 Hypothesis Development

2.2.1 The Influence of Financial Literacy on Application-Based Investment Decisions

The influence of financial literacy on application-based investment decisions can be explained through behavioral finance theory, particularly the bounded rationality approach. This theory posits that individuals do not always make optimal financial decisions due to limitations in information, time, and cognitive capacity (Simon, 1991). Financial literacy plays a crucial role in shaping an individual's financial mindset and behavior, including in the context of digital investments. Prospect Theory, developed by Kahneman and Tversky (2013), also supports this view by suggesting that individuals tend to evaluate risk based on their personal perceptions of gains and losses; therefore, strong financial knowledge helps them avoid biases when assessing investment options. Financial literacy is essential for investors to make sound investment decisions and to reduce behavioral or irrational biases in collective decision-making (Suresh, 2024). A higher level of financial literacy significantly increases the likelihood of individuals using digital financial services (Andreou & Anyfantaki, 2021). In the context of application-based investments, logically, investors with strong financial literacy are more capable of understanding market information, evaluating investment instruments objectively, and making well-informed and responsible decisions. Conversely, low financial literacy increases dependence on external information or personal intuition, which may lead to suboptimal investment decisions.

Logically, individuals with high financial literacy are better able to understand fundamental financial concepts such as risk and return, diversification, inflation, and financial planning. This understanding is crucial in the investment decision-making process, especially in today's digital era where investment applications provide quick, diverse, and convenient access. With sufficient financial literacy, investors can evaluate financial information presented within applications, understand available investment instruments, and rationally analyze potential returns and risks (Lusardi & Mitchell, 2014). Financial literacy can be defined as the ability to make effective decisions regarding money or financial resources and to determine whether individuals use their funds appropriately (Seraj et al., 2022). Therefore,

financial literacy serves as the foundational knowledge that helps investors make prudent and well-measured investment decisions when using digital platforms.

Financial literacy is vital, particularly for its positive externalities, such as improved financial decision-making, as supported by numerous studies (Andreou & Anyfantaki, 2021). Research by Andreou and Anyfantaki (2021) found that the level of financial literacy in Cyprus remains low, with only 37.33% of respondents demonstrating proficiency in financial knowledge. There is a significant positive relationship between financial knowledge and usage frequency; financially illiterate consumers tend to lack confidence in their financial and digital skills (Andreou & Anyfantaki, 2021). Financial literacy has a positive and significant effect on investment decisions. Similarly, Seraj et al. (2022) found that financial literacy exerts a positive and significant influence on investment decisions. Based on the previous studies, the following hypothesis is proposed:
H1: Financial literacy has a positive effect on application-based investment decisions.

2.2.2 The Influence of Overconfidence on Application-Based Investment Decisions
This study employs behavioral finance theory as the main framework to explain investor behavior that deviates from the rationality assumptions of traditional economic theory. Behavioral finance argues that investment decisions are not always logical but are often influenced by cognitive biases, emotions, and individual perceptions of risk and opportunity (Seraj et al., 2022). One prominent behavioral bias is overconfidence, which refers to an excessive belief in one's own abilities and knowledge when making financial decisions.

Furthermore, Prospect Theory, developed by Kahneman and Tversky (2013), strengthens this theoretical framework by explaining that investors are more sensitive to losses than to gains and often make decisions based on subjective perceptions of possible outcomes. In this context, overconfidence can cause individuals to evaluate risks inaccurately, overestimate their probability of success, and ultimately make high-risk investment decisions through digital investment applications. Logically, individuals with high levels of overconfidence tend to overestimate their ability to analyze the market. In the use of investment applications, this is reflected in their tendency to trade more frequently, ignore contradictory market information, and take greater risks compared to investors who realistically assess their abilities. The ease of access, intuitive design, and abundance of data in investment applications can further reinforce this illusion of competence.

Findings from Seraj et al. (2022) indicate that overconfidence has a positive and significant effect on investment decisions because overconfident investors believe that their decisions will yield profits, even without a strong informational basis. This aligns with the results of studies by Hidayat and Moin (2023) and Jonathan and Pradana (2025), which found that overconfidence significantly affects investment decisions. Similarly, Almansour et al. (2023) also reported that overconfidence has a positive and significant influence on investment decision-making. Based on these studies related to overconfidence, the following hypothesis is proposed:
H2: Overconfidence has a positive effect on application-based investment decisions.

2.2.3 The Influence of Herding Behavior on Application-Based Investment Decisions
One of the most common behavioral biases is herding behavior, which refers to the tendency of individuals to imitate the actions of the majority or a group, even when their personal information suggests otherwise (Ahmad & Wu, 2022). In digital application-based investing, the herding phenomenon becomes increasingly relevant as investors are directly exposed to market trends, forums, and social activities occurring in real time on digital platforms. The fast and interactive nature of these applications makes it easier for investors to be influenced by group decisions, especially when they lack confidence in their own analytical abilities.

This phenomenon is also reinforced by Prospect Theory, developed by (Kahneman & Tversky, 2013). The theory explains that individuals tend to avoid losses rather than pursue gains; thus, in uncertain situations, they prefer to follow the majority as a form of psychological protection against potential losses. Herding provides a "sense of security" by mimicking the actions of many others, even though

such decisions are not always rational or profitable. Research by Ahmad and Wu (2022) found that herding behavior has a positive effect on investment decisions, although it simultaneously reduces market efficiency and investment performance. This means that the stronger an individual's tendency to follow other investors' behavior, the more likely they are to engage in impulsive investment decisions not based on rational analysis. Such behavior can lead to excessive trading activities (overtrading) through investment applications, which ultimately negatively affect long-term outcomes.

The study by Putra (2024) found that herding behavior has a positive and significant influence on investment decisions. Similarly, previous studies by Adielyani and Mawardi (2020), and Hidayat and Moin (2023) have also shown that herding behavior positively and significantly affects investment decisions. Furthermore, Mahmood et al. (2020) found that herding behavior positively impacts investment performance and strongly influences investment decisions. Based on the previous research findings, the following hypothesis is proposed:
H3: Herding behavior has a positive effect on application-based investment decisions.

2.3 Conceptual Framework
The conceptual framework serves as a tool to organize and analyze data in the research. The following is the conceptual framework used in this study:

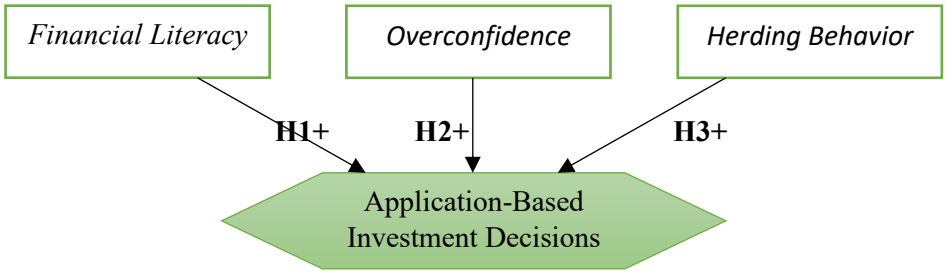

Figure 1. Research Model
Source: Processed Data (2025)

3. Research Methodology
3.1 Type of Research and Data Sources
This study employs a quantitative approach with a survey design to analyze the influence of financial literacy, overconfidence, and herding behavior on application-based investment decisions. The research utilizes primary data, which were collected through an online questionnaire distributed to investors who use investment applications such as Ajaib, Bibit, Growin', and similar platforms.

3.2 Population and Sample
The population in this study consists of all investors who possess a Single Investor Identification (SID) and reside in the Sumatra region. Investors with an SID are individuals officially registered with the Indonesian Central Securities Depository (KSEI) and actively engage in capital market investments—such as stocks, mutual funds, bonds, and other market instruments—through digital investment applications.Based on the Capital Market Monthly Statistics report for December 2024 released by the Financial Services Authority (OJK, 2025), the total number of SID holders across Indonesia's 34 provinces is 14,775,598 individuals, with 2,315,511 of them residing in Sumatra. Using this population size (2,315,511 investors) and a margin of error of 5%, the minimum required sample size, calculated using the Slovin formula, is 400 respondents.

The sample in this study was obtained using the purposive sampling technique, which involves selecting participants based on specific criteria relevant to the research objectives. The criteria for respondents are as follows: (1) Active users of investment applications such as Bibit, Ajaib, or Growin', residing in the Sumatra region; (2) Aged 18 years or older; and (3) Possessing basic knowledge of investment and willing to participate in the study. The selection of these criteria is intended to ensure that the sample accurately represents active retail investors who use investment applications, thereby enabling the collected data to reflect the characteristics of the target population effectively.

3.3 Operational Definition of Variables

Table 1. Operational Definitions and Variable Dimensions

No.	Variable	Operational Definition	Dimensions	Item
1	Financial Literacy	The level of an individual's understanding of basic financial concepts such as compound interest, inflation, risk diversification, and the ability to make effective financial decisions in a digital context (Andreou & Anyfantaki, 2021), such as investing through applications like Ajaib, Bibit, Growin', and similar platforms.	1. Understanding of compound interest. 2. Knowledge of investment diversification to reduce risk. 3. Ability to calculate potential investment returns. 4. Understanding of the impact of inflation on the value of money. (Andreou & Anyfantaki, 2021)	1 2 3 4
2	Overconfidence	Overconfidence is a common and well-established bias that leads individuals to ignore the risks associated with investments and to be overly confident in their own abilities and knowledge. (Seraj et al., 2022)	1. Self-confidence. 2. Predictive ability. 3. Alignment of perception with the market. 4. Past success experience. (Seraj et al., 2022)	5 6 7 8
3	Herding Behavior	Herding is defined as "everyone doing what others are doing, even when their private information suggests doing something quite different." (Banerjee, 1992)	1. Influence of initial market orders. 2. Influence of trading volume. 3. Social support from colleagues. 4. Reduced pressure through shared experiences. 5. Fear of deviating from trends. 6. Influence of information from peers. 7. Influence of professional market participants. (Ahmad & Wu, 2022)	9 10 11 12 13 14 15
4	Application-Based Investment Decision	Investment decision refers to risk perception, relating to how individuals view and evaluate the level of risk associated with an investment (Almansour et	1. Financial goal orientation. 2. Financial preferences. 3. Investment intention.	16 17 18 19

No.	Variable	Operational Definition	Dimensions	Item
		al., 2023). Investment decision-making refers to the art of handling complex situations when investing. In this cognitive process, individuals select the most appropriate option among all possible alternatives (Seraj et al., 2022). In this study, application-based investment decisions refer to the process by which individuals make investment choices through applications such as Ajaib, Bibit, Growin', and others, while considering risks and financial goals.	4. Financial management ability. (Seraj et al., 2022)	

Source: Processed Data (2025)

3.4 Data Collection Technique

The research data were collected through an online questionnaire using Google Forms, distributed to active users of investment applications in the Sumatra region. The research instrument employed a five-point Likert scale (1 = strongly disagree to 5 = strongly agree) to measure each research variable. The questionnaire was distributed via social media platforms and investment forums, with respondents selected based on inclusion criteria, namely active users of investment applications such as Ajaib, Bibit, Growin', and similar platforms.

3.5 Data Analysis Technique

The data were analyzed using SmartPLS 4.0 software with the Partial Least Squares–Structural Equation Modeling (PLS-SEM) approach, which is suitable for testing causal models involving latent variables (Nurillah, Aini, Timur, & Widiastuti, 2022). The PLS-SEM analysis consists of two main components: the outer model and the inner model. The outer model is used to test validity (convergent validity and discriminant validity) and reliability (Cronbach's Alpha and Composite Reliability) to ensure that the indicators consistently reflect their latent variables. Meanwhile, the inner model evaluates the structural relationships among the variables (Abdillah & Hartono, 2015; Hair Jr et al., 2021).

4. Results and Discussion

4.1 Results

This section presents the results of data processing conducted using SmartPLS 4.0. The analysis was carried out in several stages to provide a clear overview of the instrument quality, respondent characteristics, and the testing of the research model, which consists of the measurement model (outer model) and the structural model (inner model). The first stage involved reliability and validity testing through a pilot test, aimed at ensuring that the research instrument was suitable for use. The pilot test questionnaire was distributed online via Google Forms. The target respondents for the pilot test were students of the Master of Accounting Science (MIA) Program, Class of 2023, at the Faculty of Economics and Business, University of Lampung, who were considered to have characteristics relevant to the main research population.

The questionnaire form was shared through the class WhatsApp group and via personal communication with cohort members. The pilot test successfully collected responses from 32 participants, all of whom completed the questionnaire fully and according to instructions. The pilot test results were then analyzed

using SmartPLS 4.0 to assess the validity and reliability of the research variables. Overall, no indicators were removed during the pilot test stage. All indicators were retained to allow a comprehensive evaluation of wording accuracy, clarity of meaning, and respondent understanding. The results of this pilot test serve as the foundation for refining and finalizing the research instrument before its implementation in the main study.

4.1.1 Questionnaire Distribution

The main questionnaire was distributed online using the Google Forms platform. The questionnaire was designed as a set of closed-ended questions based on a Likert scale and distributed through various digital communication channels—primarily Facebook, WhatsApp groups, Telegram groups, and personal communication—to reach respondents who matched the characteristics of the study population, namely individuals engaged in application-based (online) investment activities. The target population of this research consisted of Indonesian individuals with experience in making application-based investment decisions, using platforms such as Ajaib, Bibit, Growin', Bareksa, Stockbit, Indodax, Pintu, and similar applications.

The questionnaire distribution employed a non-probability sampling method using purposive sampling, where respondents meeting the inclusion criteria were invited to participate voluntarily. The inclusion criteria for respondents were as follows: (1) Active users of investment applications (such as Bibit, Ajaib, Growin', etc.) residing in the Sumatra region; (2) Aged 18 years or older; and (3) Having basic knowledge of investment and willingness to participate in the study. The questionnaire distribution process took place over several weeks, from June to July, and successfully collected 400 valid responses that met the research criteria. This number satisfied the minimum sample size requirement calculated using the Slovin formula and accounted for the number of indicators and the model's complexity within the PLS-based SEM analysis. All respondent data were subsequently processed using SmartPLS 4.0 for testing both the measurement model (outer model) and the structural model (inner model).

4.1.2 Respondent Characteristics

The characteristics of respondents in this study aim to describe the demographic profile of individual investors who served as the research subjects. A total of 400 respondents were successfully collected, and all data were declared valid for analysis. The detailed distribution is presented in Table 2 below:

Table 2. Respondent Characteristics

No.	Category	Number	Percentage
1.	Age		
	- 18-25 years - 26-35 years - 36-45 years - 46-55 years - > 55 years	89 187 103 17 4	22,3% 46,8% 25,8% 4,2% 1%
2.	Gender		
	- Male - Female	199 201	49,8% 50,2%
3.	Education Level		
	- Elementary/Junior High School - Senior High/Vocational School - Diploma (D1/D2/D3) - Bachelor's Degree (S1) - Master's Degree (S2) - Doctoral Degree (S3)	3 96 113 158 28 2	0,8% 24% 28,3% 39,5% 7% 0,5%
4.	Occupation		

No.	Category	Number	Percentage
	- Student - Entrepreneur - Private Employee - Civil Servant (PNS) - Others: _____	57 116 149 63 15	14,2% 29% 37,2% 15,7% 3,9%
5.	Investment Experience		
	- < 1 year - 1-3 years - 4-6 years - > 6 years	66 313 20 1	16,5% 78,3% 5% 0,2%
6.	Investment Application (Respondents could select > 1)		
	- Ajaib - Bibit - Growin` - Others: _____	78 311 75 15	19,5% 77,8% 18,8% 4,1%
7.	Duration of Investment App Usage		
	- Less than 6 months - 6 months – 1 year - 1-2 years - More than 2 years	49 65 263 23	12,3% 16,3% 65,8% 5,8%
8.	Transaction Frequency		
	- Rarely (< 1 time) - 1-3 times - 4-6 times - More than 6 times	48 254 84 14	12% 63,5% 21% 3,5%
9.	Investment Instruments (Respondents could select > 1)		
	- Stocks - Mutual Funds - Bonds - Others: _____	329 111 35 10	82,3% 27,8% 8,8% 2,9%

Source: Processed Data (2025)

4.1.3 Descriptive Statistical Analysis

Descriptive statistical analysis was conducted to understand the response trends of respondents for each indicator within the research variables, namely financial literacy, overconfidence, herding behavior, investment decisions, and religiosity. Each indicator was measured using a Likert scale ranging from 1 to 5, where a value of 1 indicates strong disagreement and a value of 5 indicates strong agreement.

Table 3. Descriptive Statistics

Variable	Indicator	N	*Mean*	Median	Min	Max	Standard deviation
Financial	FL1	400	4,112	4,000	1	5	0,745
Literacy	FL2	400	4,183	4,000	1	5	0,768
	FL3	400	4,040	4,000	1	5	0,935

	FL4	400	4,105	4,000	1	5	0,815
Overconfidence	OC1	400	3,965	4,000	1	5	0,940
	OC2	400	4,188	4,000	1	5	0,862
	OC3	400	4,053	4,000	1	5	0,794
	OC4	400	4,117	4,000	1	5	0,754
Herding	HB1	400	3,837	4,000	1	5	0,912
Behavior	HB2	400	4,032	4,000	1	5	0,855
	HB3	400	3,815	4,000	1	5	0,952
	HB4	400	3,530	4,000	1	5	1,249
	HB5	400	3,755	4,000	1	5	1,153
	HB6	400	3,840	4,000	1	5	0,954
	HB7	400	4,055	4,000	1	5	0,907
Investment	KI1	400	4,175	4,000	1	5	0,787
Decision	KI2	400	3,675	4,000	1	5	1,214
	KI3	400	4,000	4,000	1	5	0,880
	KI4	400	4,103	4,000	1	5	0,879

Source: Processed Data (2025)
Note: FL = *Financial Literacy*, OC = *Overconfidence*, HB = *Herding Behavior*, KI = Investment Decision, RG = Religiusitas.

The results of the analysis presented in Table 3 show that the financial literacy construct has a high mean value across all indicators, ranging from 4.04 to 4.18, with relatively low standard deviations between 0.75 and 0.93. This indicates that the majority of respondents consider themselves to have a good understanding of basic investment concepts such as risk, returns, and compound interest, suggesting a relatively strong level of financial literacy. The overconfidence construct also demonstrates a positive tendency, with mean values ranging from 3.965 to 4.188 and standard deviations between 0.75 and 0.94. These findings suggest that respondents possess a relatively high level of confidence in making investment decisions, even though they may not necessarily have a professional background in finance. This self-confidence can positively influence their willingness to take risks in investment activities.

Meanwhile, the herding behavior indicators show mean values between 3.53 and 4.06. Some indicators, such as HB4 and HB5, exhibit higher standard deviations (above 1.1), indicating considerable variation in respondents' perceptions regarding their tendency to follow others' investment decisions. This finding suggests that while some respondents tend to follow market trends or other investors' decisions, others display a more independent approach. The investment decision construct shows relatively high mean values ranging from 3.68 to 4.18. The indicator KI2 has a higher standard deviation (1.22) compared to the others, indicating notable variation among respondents' perceptions toward that indicator. Overall, this implies that most respondents have strong confidence and intention in making application-based investment decisions. In general, the results of the descriptive analysis indicate that respondents in this study tend to possess good financial literacy, high levels of self-confidence, and an awareness of religious values in their investment behavior. These findings provide an important initial insight to support hypothesis testing in the subsequent structural model analysis stage.

4.1.4 Outer Model Analysis

At this stage, an outer model analysis was conducted to assess the extent to which the indicators used in the study accurately and consistently represent the latent constructs. Testing the outer model is essential because research results can only be meaningfully interpreted if the instruments employed demonstrate adequate validity and reliability. Therefore, this analysis is divided into two main parts:

validity testing and reliability testing. Through these steps, it can be ensured that the indicators used are both valid and reliable, thus supporting the accuracy of the structural model testing in the next stage.

4.1.4.1 Validity Testing

The validity test aims to ensure that the indicators used genuinely measure the constructs established in the study. In PLS-SEM, indicator validity is assessed through three main aspects: evaluation of the measurement (outer) model, convergent validity, and discriminant validity. The evaluation of the measurement model is used to assess the outer loading values of each indicator in relation to its corresponding construct. Furthermore, convergent validity is analyzed by examining the Average Variance Extracted (AVE) values to confirm the appropriateness of the indicators in explaining the latent variables. Meanwhile, discriminant validity testing is performed to determine the extent to which one construct empirically differs from others. Through these tests, the research instrument can be confirmed as having valid measurement capability in representing the latent variables before proceeding to the reliability assessment.

4.1.4.2 Measurement (Outer) Model Evaluation

The measurement model evaluation or outer model aims to assess the quality of the research instrument used to measure latent constructs. In reflective measurement models, the evaluation is carried out through three main stages: (1) Convergent validity, (2) Discriminant validity, and (3) Construct reliability (Hair Jr et al., 2021). Figure 2 below presents the outer loading and R^2 values of the constructs obtained from the analysis using SmartPLS 4.0.

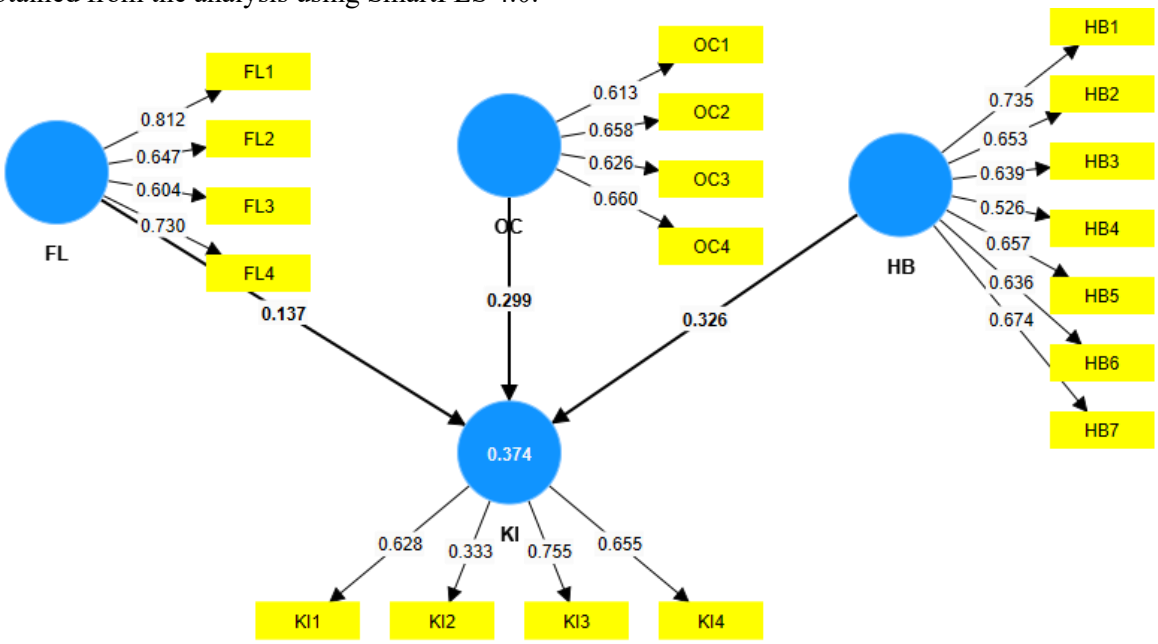

Figure 2. Measurement Model (Outer Model) (1)
Source: SmartPLS 4.0, 2025

Based on Table 4, the financial literacy (FL) indicators show outer loading values ranging from 0.604 to 0.812, indicating that all indicators are sufficiently valid. For the overconfidence (OC) construct, the loading values range between 0.613 and 0.660. Although some values are below 0.7, they are still acceptable since the construct's reliability is adequate; however, these indicators will be reviewed to improve the Average Variance Extracted (AVE). The herding behavior (HB) construct has indicator loading values ranging from 0.526 to 0.735, with HB4 (0.526) showing the lowest loading value, though still within an acceptable tolerance range. This value may be retained if it does not significantly reduce the AVE but will nonetheless be reviewed. For the investment decision (KI) construct, indicator loading values vary from 0.333 to 0.755, with KI2 recording the lowest loading value (0.333), which will be reconsidered as it falls below the ideal minimum threshold.

Table 4. Loading Factor 1

`	*Finansial*	*Overconfidence*	*Herding*	**Investment**
Loading	***Literacy***		***Behavior***	**Decision**
FL1	0,812			
FL2	0,647			
FL3	0,604			
FL4	0,730			
OC1		0,613		
OC2		0,658		
OC3		0,626		
OC4		0,660		
HB1			0,735	
HB2			0,653	
HB3			0,639	
HB4			0,526	
HB5			0,657	
HB6			0,636	
HB7			0,674	
KI1				0,628
KI2				0,333
KI3				0,755
KI4				0,655

Source: Processed using SmartPLS 4.0, 2025
Note: FL = Financial Literacy, OC = Overconfidence, HB = Herding Behavior, KI = Investment Decision.

The analysis of outer loading values, Average Variance Extracted (AVE), and Composite Reliability (CR), as recommended by Hair Jr et al. (2021), was conducted, and the results are presented in Table 4.6 (Loading Factor 2). Based on the data processed using SmartPLS 4.0, it was found that most indicators have outer loading values above the minimum threshold of 0.6, indicating that these indicators consistently reflect their corresponding constructs. However, several indicators showed loading values below the standard minimum of 0.7, or even below 0.6. To improve convergent validity and increase the AVE values of each construct, several indicators with the lowest loading values were removed.

Some indicators with low outer loading values (< 0.70) were deleted to enhance convergent validity. For the financial literacy construct, indicator FL3 (0.604) was removed, resulting in an increase in AVE from 0.494 to 0.578. For overconfidence, indicator OC1 (0.613) was removed, raising the AVE from 0.409 to 0.512. In the herding behavior construct, three indicators with the lowest loadings—HB3 (0.639), HB4 (0.526), and HB5 (0.636)—were deleted, thereby increasing the AVE from 0.420 to 0.537. For the investment decision construct, indicator KI2 (0.333) was removed, which raised the AVE from 0.376 to 0.517. After these adjustments, all constructs met the required criteria, with AVE > 0.50 and CR > 0.70, indicating that the constructs were valid and reliable, even though some Cronbach's Alpha values remained slightly below 0.70.

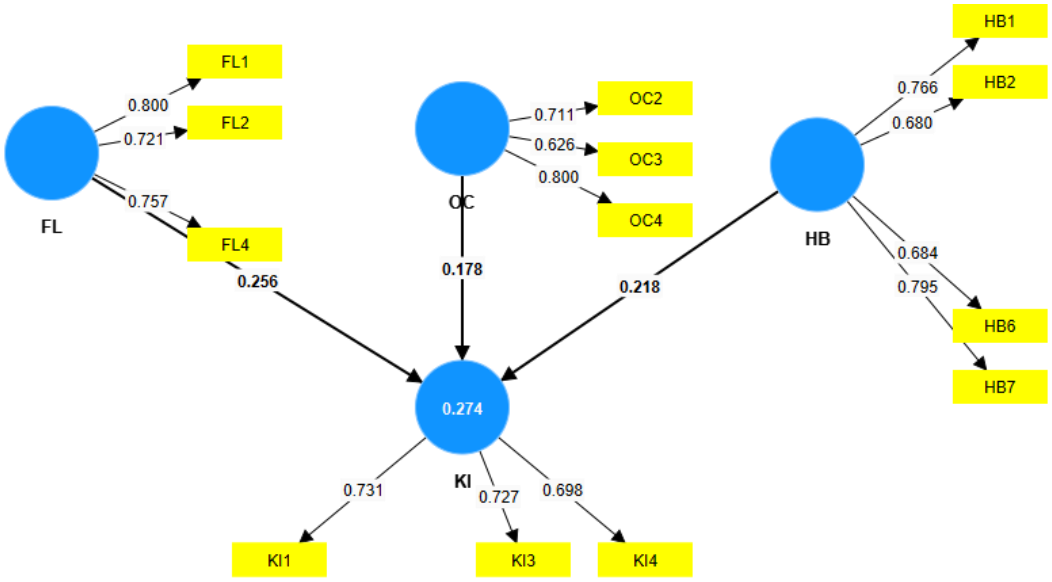

Figure 3. Measurement Model (Outer Model) Evaluation (2)
Source: SmartPLS 4.0, 2025

After removing six indicators with the lowest outer loading values to improve the Average Variance Extracted (AVE), the final model was obtained as shown in Figure 3.

4.1.4.3 Convergent Validity

Convergent validity measures the extent to which the indicators within a construct are correlated and collectively represent the same underlying concept. The assessment of convergent validity can be observed through two key indicators: the outer loading values and the Average Variance Extracted (AVE) values.

Table 5. Loading Factor 2

Outer Loading	***Financial Literacy***	***Overconfidence***	***Herding Behavior***	**Investment Decision**
FL1	0,800			
FL2	0,721			
FL4	0,757			
OC2		0,711		
OC3		0,626		
OC4		0,800		
HB1			0,766	
HB2			0,680	
HB6			0,684	
HB7			0,795	
KI1				0,731
KI3				0,727
KI4				0,698

Source: Processed using SmartPLS 4.0, 2025
Note: FL = Financial Literacy, OC = Overconfidence, HB = Herding Behavior, KI = Investment Decision.

The results of data processing using SmartPLS (Table 4.4) show that all indicators have outer loading values above 0.60, indicating that they adequately reflect their respective constructs. The financial literacy indicators range from 0.721 to 0.800, overconfidence from 0.626 to 0.800, herding behavior from 0.680 to 0.795, and investment decision from 0.698 to 0.731. Therefore, all constructs meet the convergent validity criteria as recommended by (Hair Jr et al., 2021).

Table 6. AVE

Variable	*Average variance extracted* (AVE)
FL	0,578
OC	0,512
HB	0,537
KI	0,517

Source: Processed using SmartPLS 4.0, 2025
Note: FL = Financial Literacy, OC = Overconfidence, HB = Herding Behavior, KI = Investment Decision.

Furthermore, to comprehensively assess convergent validity, the Average Variance Extracted (AVE) values were examined as shown in Table 4.5, with the recommended minimum threshold being 0.50 (Hair Jr et al., 2021). The data analysis results indicate that all constructs meet this criterion, namely financial literacy (AVE = 0.578), overconfidence (AVE = 0.512), herding behavior (AVE = 0.537), and investment decision (AVE = 0.517). Therefore, it can be concluded that all constructs in this study are convergently valid, as their AVE values exceed the recommended threshold. Overall, the measurement model satisfies the convergent validity requirements and is thus suitable for further analysis.

4.1.4.4 Discriminate Validity
Discriminant validity is used to ensure that each construct in the model is clearly distinct from the others. In this study, discriminant validity was tested using two methods: the Heterotrait-Monotrait Ratio (HTMT) and Cross Loading.

1. Heterotrait-Monotrait Ratio (HTMT)
   The HTMT is one of the recommended methods in PLS-SEM for assessing discriminant validity. According to Henseler et al. (2015), the HTMT value should be below 0.90 to confirm adequate discriminant validity. Based on Table 7, most construct pair values are below the 0.90 threshold. However, one construct pair—overconfidence (OC) and financial literacy (FL)—shows a value above 0.90, specifically 1.031. An HTMT value exceeding 0.90 indicates a high similarity between the overconfidence and financial literacy constructs, suggesting a potential discriminant validity issue. This needs to be taken into consideration when interpreting the structural model results and may serve as a basis for future model refinement or revision.

   Table 7. *Discriminant Validity – Heterotrait-Monotrait Ratio* (HTMT)

Konstruk	FL	HB	KI	OC
FL	–	0,588	0,773	1,031
HB		–	0,620	0,633
KI			–	0,771
OC				–

   Source: Processed using SmartPLS 4.0, 2025
   Note: FL = Financial Literacy, OC = Overconfidence, HB = Herding Behavior, KI = Investment Decision.

2. Cross Loading
   The cross loading test is used to assess discriminant validity by comparing the loading value of each indicator on its respective construct with its loadings on other constructs. An indicator is considered

valid if its loading value on its original construct is higher than its loadings on other constructs. Based on Table 8, it can be seen that each indicator has the highest loading value on the construct it measures. For example, indicators FL1 (0.800), FL2 (0.721), and FL4 (0.757) have the highest loading values on the Financial Literacy (FL) construct compared to other constructs. A similar pattern is observed in the Herding Behavior (HB) construct, where indicators such as HB1 (0.766), HB2 (0.680), and HB7 (0.795) show the highest loadings on the HB construct.

For the Investment Decision (KI) construct, indicators KI1 (0.735), KI3 (0.729), and KI4 (0.698) have the highest loading values on the KI construct. Meanwhile, indicators in the Overconfidence (OC) construct also show consistency, such as OC2 (0.711), OC3 (0.626), and OC4 (0.800), which record the highest loadings on the OC construct. Therefore, the cross-loading results indicate that all indicators have higher correlations with their respective constructs than with other constructs. Consequently, it can be concluded that the research model meets the discriminant validity criteria based on the cross loading test.

Table 8. *Discriminant Validity – Cross Loading*

Indikator	**FL**	**HB**	**KI**	**OC**
FL1	0.800	0.340	0.360	0.511
FL2	0.721	0.287	0.352	0.435
FL4	0.757	0.283	0.313	0.435
HB1	0.258	0.766	0.279	0.261
HB2	0.300	0.680	0.237	0.344
HB6	0.250	0.684	0.256	0.283
HB7	0.356	0.795	0.349	0.258
KI1	0.348	0.305	0.731	0.245
KI3	0.325	0.249	0.727	0.366
KI4	0.299	0.286	0.698	0.287
OC2	0.353	0.227	0.251	0.711
OC3	0.421	0.284	0.267	0.626
OC4	0.510	0.305	0.361	0.800

Source: Processed using SmartPLS 4.0, 2025
Note: FL = Financial Literacy, OC = Overconfidence, HB = Herding Behavior, KI = Investment Decision.

4.1.4.5 Reliability Testing
After the research instrument was confirmed to be valid, the next step was to conduct a reliability test to assess the internal consistency among indicators in measuring latent constructs. In PLS-SEM, reliability testing generally uses two main measures: Composite Reliability (CR) and Cronbach's Alpha. Composite reliability evaluates the overall consistency of the indicators within a construct, while Cronbach's Alpha measures reliability based on the homogeneity of the indicators forming the construct. Through this reliability testing, it can be ensured that the research instrument is not only valid but also reliable in producing stable data for structural model testing.

4.1.4.6 Composite Reliability and Cronbach's Alpha
Composite Reliability (CR) and Cronbach's Alpha are used to measure the internal consistency of the indicators within each construct. According to Hair Jr et al. (2021), a minimum CR value of 0.70 indicates good internal reliability of the construct. Meanwhile, an acceptable Cronbach's Alpha value is generally ≥ 0.60, although in exploratory research, a minimum value of 0.60 is still considered tolerable (Ghozali & Latan, 2015).

Table 9. Composite Reliability and Cronbach's Alpha Values

Variabel	***Composite Reliability* (rho_c)**	***Cronbach's Alpha***
Financial Literacy	0,804	0,634
Overconfidence	0,757	0,526
Herding Behavior	0,822	0,714
Keputusan Investasi	0,762	0,532

Source: Processed using SmartPLS 4.0, 2025

Based on the SmartPLS 4.0 output presented in Table 4.8, which displays the Composite Reliability (CR) and Cronbach's Alpha values, all constructs in this study demonstrate an adequate level of reliability when assessed using CR values. The Financial Literacy (FL) construct recorded a CR value of 0.804 and a Cronbach's Alpha of 0.634. Although the alpha value is slightly below the ideal threshold of 0.70, this construct is still considered reliable since its CR value exceeds the minimum recommended threshold of 0.70. The Overconfidence (OC) construct shows a CR value of 0.757 and a Cronbach's Alpha of 0.526. Despite the alpha value being below the standard, the satisfactory CR value indicates sufficient internal consistency; therefore, this construct is retained, especially considering that the study is exploratory in nature.

Furthermore, the Herding Behavior (HB) construct exhibits good reliability, with a CR value of 0.822 and a Cronbach's Alpha of 0.714, both above the recommended limits. The Investment Decision (KI) construct has a CR value of 0.762 and a Cronbach's Alpha of 0.532. Although the alpha value is below 0.60, the acceptable CR value and valid indicators support the decision to retain this construct in the research model. Overall, even though several Cronbach's Alpha values fall slightly below the ideal threshold, all constructs have Composite Reliability (CR) values above 0.70. Considering that CR is generally preferred over Cronbach's Alpha in PLS-SEM analysis Hair Jr et al. (2021), it can be concluded that all constructs in this study are reliable and can be maintained within the measurement model.

4.1.5 Structural Model Testing (Inner Model)

The structural model testing or inner model aims to determine the extent to which independent variables contribute to explaining the dependent variable. One of the primary measures used in evaluating the inner model is the R-square (R^2) value.

Table 10. R-square and Adjusted R-square Values

Konstruk	**R-Square**	***R-square* Adjusted**

Source: Processed using SmartPLS 4.0, 2025

Based on the data processed using SmartPLS 4.0, as shown in Table 10, the R-square (R^2) value for the Investment Decision (KI) variable is 0.274, with an Adjusted R-square value of 0.269. This indicates that 27.4% of the variation in investment decisions can be explained by the independent variables in the model—namely, financial literacy, overconfidence, and herding behavior—while the remaining 72.6% is explained by other factors outside this research model.

According to Chin (1998), R-square values can be categorized into three levels:

$R^2 = 0.67 \rightarrow$ Strong
$R^2 = 0.33 \rightarrow$ Moderate
$R^2 = 0.19 \rightarrow$ Weak

Thus, the R^2 value of 0.274 falls within the weak to approaching moderate category. Although the model does not yet have strong explanatory power, this result still demonstrates that the independent variables studied make a meaningful contribution to investment decision-making. After examining the R-square

values, the next step is to analyze the significance of relationships among latent variables in the structural model. This analysis is conducted by examining the path coefficients, t-statistics, and p-values for each relationship between variables, as presented in Table 11.

Table 11. *Path Coefficients - Mean,* STDEV, *T-statistics, dan P-values*

No.	Relationships Between Variables	*Original Sample* (O)	*Sample Mean* (M)	*Standard Deviation* (STDEV)	T *Statistics*	P *Values*
1	*Financial Literacy* (FL) → Investment Decision (KI)	0,256	0,255	0,068	3,732	0,000
2	*Herding Behavior* (HB) → Investment Decision (KI)	0,218	0,220	0,076	2,856	0,004
3	*Overconfidence* (OC) → Investment Decision (KI)	0,178	0,186	0,070	2,537	0,011

Source: Processed using SmartPLS 4.0, 2025

4.1.5.1 Direct Relationships

Based on the SmartPLS output, the following results were obtained:

Table 12. T-Statistic Results of the Measurement Model (Direct Effects)

Relationship	Path Coefficient	T-Statistik	P-Value	Description
Finansial Literacy → Investment Decision	0,256	3,732	0,000	Signifikan
Herding Behavior → Keputusan Investasi	0,218	2,856	0,004	Signifikan
Overconfidence → Investment Decision	0,178	2,537	0,011	Signifikan

Source: Processed using SmartPLS 4.0, 2025

Based on Table 4.11, the three independent variables—financial literacy (FL), herding behavior (HB), and overconfidence (OC)—have a significant positive effect on investment decisions (KI). This is indicated by t-statistics > 1.96 and p-values < 0.05, confirming that hypotheses H1, H2, and H3 are supported by the research data.

H1: Financial literacy has a positive effect on application-based investment decisions.
The analysis results show that financial literacy has a positive and significant influence on investment decisions ($\beta = 0.256$; $t = 3.732$; $p = 0.000$). This finding means that the higher an investor's financial literacy, the better the quality of their investment decisions, especially when using digital investment applications. Adequate financial literacy enables investors to understand risks and opportunities, manage information effectively, and avoid mistakes caused by psychological biases.

H2: Overconfidence has a positive effect on application-based investment decisions.
The testing results indicate that overconfidence also has a positive and significant impact on investment decisions ($\beta = 0.178$; $t = 2.537$; $p = 0.011$). This suggests that a high level of self-confidence encourages investors to be more proactive in making investment decisions through applications. However, while the effect is positive, excessive overconfidence can still increase risk if not balanced with rational judgment.

H3: Herding behavior has a positive effect on application-based investment decisions.
Based on the analysis, herding behavior is found to have a positive and significant influence on investment decisions (β = 0.218; t = 2.856; p = 0.004). This indicates that the tendency of investors to follow the majority or market trends contributes to shaping investment decisions in digital platforms. Such behavior suggests that, under uncertain information conditions, investors often make decisions by imitating others' actions—even when those decisions are not necessarily based on rational analysis.

The effect size test (f^2) is conducted to measure the magnitude of the contribution of independent latent variables to the dependent latent variable within the structural model. The f^2 value indicates how much influence a construct has on another construct when the former is removed from the model (Hair Jr et al., 2021). The interpretation criteria for f^2 values refer to the guidelines provided by Cohen (2013) and Hair Jr et al. (2021), as follows:

Table 13. Interpretation Criteria for f^2 Values

f^2 Value	**Interpretation**
0,02 – 0,15	Small effect
0,15 – 0,35	Medium effect
> 0,35	Large effect
< 0,02	Not significant

Source: Cohen (2013) and Hair Jr et al. (2021)

Based on the SmartPLS 4.0 output, the following are the f^2 values for each relationship between variables:

Table 14. f^2 Values

Variable Relationships	**f^2 Value**	**Interpretation**
Financial literacy → Investment Decision	0,054	Small effect
Overconfidence → Investment Decision	0,027	Small effect
Herding behavior → Investment Decision	0,053	Small effect

Source: Processed using SmartPLS 4.0

Based on the effect size (f^2) test results presented in Table 4.13, the variables financial literacy (f^2 = 0.054), overconfidence (f^2 = 0.027), and herding behavior (f^2 = 0.053) all fall into the small effect category (0.02–0.15) according to the criteria by Cohen (2013) and Hair Jr et al. (2021). These findings indicate that the three independent variables contribute a relatively small effect on investment decisions, yet still exert a meaningful influence within the research model. Thus, both financial literacy and psychological factors of investors play a role in shaping investment decision-making processes, even though their influence is not dominant.

The predictive relevance test (Q^2) is used to assess how well the model can predict endogenous constructs. According to Hair Jr et al. (2021), a Q^2 value greater than 0.00 indicates that the model has predictive capability, with the following interpretation categories: 0.02 = small predictive relevance; 0.15 = medium predictive relevance; 0.35 = large predictive relevance

Table 15. Q^2 (Predictive Relevance) Values – Cross-Validated Redundancy

No	Konstruk	SSO	SSE	Q^2 (= 1 - SSE/SSO)
1	*Financial Literacy* (FL)	1200,000	1200,000	0,000
2	*Herding Behavior* (HB)	1600,000	1600,000	0,000
3	Investment Decision (KI)	1200,000	1043,572	0,130
4	*Overconfidence* (OC)	1200,000	1200,000	0,000

Source: Processed using SmartPLS 4.0, 2025

The results of the Q^2 test show that the constructs financial literacy, herding behavior, and overconfidence have Q^2 values of 0.000, as they serve as independent variables, while the investment decision construct has a Q^2 value of 0.130. This value falls within the small category (0.02–0.15) according to Hair Jr et al. (2021), indicating that the research model has predictive relevance for investment decisions, although at a low level.

4.1.6 Hypothesis Testing

Hypothesis testing in this study was conducted to evaluate the direct effects and moderating relationships between constructs in the structural model. Based on the path coefficient estimates and significance values (p-values) obtained from SmartPLS analysis, conclusions were drawn for the three main hypotheses proposed.

Hypothesis 1 (H1): Financial literacy positively influences application-based investment decisions.
The analysis results show that this relationship is statistically significant and positive, thus H1 is accepted. This indicates that the higher an individual's level of financial literacy, the better their investment decision-making when using digital investment applications.

Hypothesis 2 (H2): Overconfidence positively influences application-based investment decisions.
The path estimation results indicate that overconfidence has a positive and significant effect on investment decisions. Therefore, H2 is accepted. This means that investors' excessive confidence in their knowledge or abilities encourages them to make more active investment decisions through digital platforms.

Hypothesis 3 (H3): Herding behavior positively influences application-based investment decisions.
Based on the data analysis results, this relationship is significant and positive, meaning H3 is also accepted. This shows that the tendency to follow other investors' decisions or market trends motivates individuals to invest through digital applications. Overall, the results indicate that all three main hypotheses (H1, H2, and H3) are supported by the data, confirming that financial literacy, overconfidence, and herding behavior each have a meaningful positive influence on application-based investment decision-making.

4.2 Discussion

4.2.1 The Effect of Financial Literacy on Application-Based Investment Decisions

Based on the results of the structural model (inner model) testing, it was found that the financial literacy variable has a positive and significant effect on application-based investment decisions. This result is supported by a positive path coefficient and a significant p-value (< 0.05). These findings indicate that the higher an individual's level of financial literacy, the greater their likelihood of making accurate investment decisions through digital applications.

This finding aligns with the Theory of Planned Behavior (TPB) proposed by Ajzen (1991), which states that an individual's behavior is influenced by intentions that are shaped by attitudes based on knowledge (in this context, financial literacy). Individuals who have a solid understanding of financial products, investment risks, portfolio diversification, and personal financial management are more confident in using investment applications and tend to make more rational decisions. Furthermore, this finding is consistent with studies by Seraj et al. (2022) and Agarwal, Rao, and Nogueira (2025), which revealed that financial literacy has a significant positive influence on investment decisions. Similarly, research by Putra (2024) and Nugraheni, Kellen, and Rozari (2021) also concluded that financial literacy significantly affects investment decision-making. In addition, Ikhsan, Ismiyanti, and Komalasari (2024) found that financial literacy significantly influences rational investment decision-making.

In the current digital era, financial literacy not only encompasses fundamental financial knowledge but also involves digital financial skills, including the ability to access, evaluate, and utilize financial information through online platforms. Therefore, it can be concluded that financial literacy is a crucial factor that drives individual investors to be more proactive and careful in making application-based investment decisions. Hence, initiatives to enhance financial literacy—such as digital financial education programs, investment seminars, and educational features within investment applications—are essential to support wise and informed investment decision-making among the public.

4.2.2 The Effect of Overconfidence on Application-Based Investment Decisions

The results of the structural model (inner model) testing indicate that the overconfidence variable has a positive and significant effect on application-based investment decisions. The positive path coefficient and the p-value < 0.05 demonstrate that the higher the level of investor confidence, the greater their tendency to make active investment decisions through digital applications.

Overconfidence represents a psychological condition in which individuals overestimate their abilities or knowledge when making investment decisions. Overconfident investors often believe they can outperform the market or make better investment decisions than others. In the context of investment applications, which provide easy access and rapid information flow, this behavior tends to appear more prominently because investors feel they have sufficient control and information to act. This result is consistent with previous studies by Adil, Singh, and Ansari (2022), Almansour et al. (2023), Herlina, Hadianto, Winarto, and Suwarno (2020), and Seraj et al. (2022), which found that overconfidence has a positive and significant impact on investment decision-making. These studies suggest that higher confidence encourages individuals to trade or invest more frequently, even at higher risk levels. However, this finding contrasts with Rahman and Gan (2020), who found that overconfidence has a negative relationship with investment decisions.

On one hand, a high level of self-confidence can stimulate more active participation in investments; on the other hand, if not supported by adequate financial literacy, overconfidence may lead to irrational decision-making. In this context, although the influence of overconfidence on application-based investment decisions is positive, this behavior still carries potential negative consequences if investors ignore risks or crucial information during decision-making. Therefore, education on cognitive biases and risk management remains essential to help investors maintain a balance between confidence and prudence in their investment behavior.

4.2.3 The Effect of Herding Behavior on Application-Based Investment Decisions
Based on the results of the structural model (inner model) analysis, the herding behavior variable was found to have a positive and significant effect on application-based investment decisions. The positive path coefficient accompanied by a p-value below 0.05 indicates that the tendency to follow majority or group decisions contributes to investment decision-making through digital platforms.

Herding behavior reflects the tendency of individuals to imitate or follow the behavior of a group when making investment decisions, regardless of their own information or analysis. In the digital era, where investors have wide access to opinions, forums, social media, and community features within investment applications, this behavior has become increasingly common. Investors often rely on behavioral "signals" from others as a basis for decision-making, especially when they lack confidence or sufficient knowledge.

This finding supports the results of Ahmad and Wu (2022) and Putra (2024), who found that herding behavior has a positive influence on investment decisions. This indicates that herding behavior contributes to investment activity, particularly among retail investors, who often face information or experience limitations. Similarly, Rahyuda and Candradewi (2023) also reported that herding behavior significantly affects investment decisions. Many investors follow market trends or popular actions due to Fear of Missing Out (FOMO) or the assumption that collective decisions are inherently valid. On the other hand, although herding can help in uncertain situations, it also carries substantial risk—such as asset price bubbles and decisions that lack fundamental analysis. Therefore, it is important for investors to strengthen their financial literacy to critically evaluate information rather than merely following others' decisions. In conclusion, the results of this study indicate that herding behavior plays a considerable role in shaping application-based investment decisions, but it also highlights the need for financial education to balance social influence with individual rationality in investment behavior.

5. Conclusions
This study examined the effects of financial literacy, overconfidence, and herding behavior on application-based investment decisions, involving 400 respondents and analyzed using SmartPLS. The results show that all three variables have a positive and significant influence on investment decisions. Financial literacy encourages more rational decision-making, overconfidence increases the tendency to invest actively, while herding behavior indicates that group decisions or market trends also act as drivers in investment activities. These findings highlight the crucial roles of cognitive, psychological, and social factors in shaping digital investment behavior in Indonesia.

Limitations and Future Research
This study has several limitations. The sample was limited to users of investment applications with specific demographic characteristics, which restricts the generalizability of the findings. Additionally, the quantitative SEM-PLS approach could not fully explore the deeper psychological motivations of investors, and external variables such as macroeconomic conditions and technological development were not included in the model. Future research is recommended to involve more diverse respondents, incorporate additional variables such as risk tolerance, financial behavior, and digital literacy, use qualitative or mixed-methods approaches, and conduct longitudinal studies to capture the evolving dynamics of investor behavior alongside the growth of fintech.

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