 http://dx.doi.org/10.17287/kbr.2025.29.3.185

A Case Analysis of Artificial Intelligence-Based Financial Systems Aimed at Mitigating Investor Behavioral Biases*

Jungran Kim**
Byungsuk Han***

The field of behavioral finance has extensively explored the ways in which cognitive biases and irrational decision-making patterns adversely affect the investment performance of individuals. This research investigates how investor biases can be addressed within digital platforms by combining insights from behavioral finance with the capabilities of artificial intelligence (AI). Through an analysis of robo-advisory services such as Betterment and Wealthfront, as well as Korean fintech platforms including Kakao Pay Securities and Toss, this study explores how behavioral finance principles are practically implemented in digital investment environments. The findings indicate that tailored, AI-powered investment guidance, along with automated portfolio strategies and digital nudging methods, can play a significant role in reducing cognitive biases such as overconfidence and loss aversion. This combined strategy demonstrates considerable promise in fostering more stable and rational investor behavior, ultimately contributing to improved long-term financial performance. Also the study discusses the practical implications and limitations of AI-based digital behavioral finance strategies and proposes future research directions.

Key Words: Behavioral Finance, AI, Fintech, Robo-advisor, Digital Nudging

Ⅰ. Introduction

Traditional financial theory assumes that investors make rational decisions; however, research in behavioral finance has consistently shown that investor behavior is often shaped by cognitive errors and psychological biases. For instance, overconfidence can lead investors to engage in unnecessary trading, and loss aversion may cause irrational selling during market downturns, negatively impacting investment performance (Kahneman & Tversky, 1979; De Bondt & Thaler, 1985; Barber & Odean, 2002).

To address these behavioral pitfalls, financial institutions and regulators have implemented various strategies, such as investor education programs and financial coaching interventions (Theodos et al., 2015; Financial

Received: 2025. 05. 11. First Revision Received: 2025. 06. 10. Second Revision Received: 2025. 07. 07. Accepted: 2025. 07. 19.
* The authors declare that no financial support was received from any of the platforms analyzed in this study.
** School of Business, Hanyang University(kimjungran2012@gmail.com), First Author
*** School of Business, Hanyang University(bhan@hanyang.ac.kr), Corresponding Author

Conduct Authority, 2020). AI-based algorithms can analyze large volumes of investor behavior data to detect bias patterns and deliver timely, tailored nudges through digital channels (D'Acunto et al., 2019; Lee, 2019).

However, despite the growing real-world adoption of AI-powered technologies, empirical case studies examining their application remain limited. Accordingly, this paper aims to bridge the gap between theoretical frameworks and practical applications within the domain of behavioral finance.

To achieve its research aims, this study compares how each digital investment platform detects specific behavioral biases and examines the respective strategies such as AI algorithms, user experience (UX) design, and content delivery implemented to mitigate them. Through this comparative analysis, the study assesses the extent to which behavioral finance theories are operationalized within digital investment platforms, evaluates their effectiveness, and derives implications for advancing investor protection and fostering innovation in the financial sector.

Building on the foundations of Prospect Theory (Kahneman & Tversky, 1979) and Sunstein's (2016) concept of digital nudging, this study explores how two robo-advisors from the U.S. and two fintech platforms from South Korea approach user decision-making. While Prospect Theory sheds light on cognitive tendencies like loss aversion, Sunstein's model provides insight into how features such as default settings and visual prominence can be used to mitigate these biases within digital interfaces.

Ⅱ. Literature Review

Investor behavior, as analyzed through the lens of behavioral finance, reveals the presence of several recurring cognitive distortions including overconfidence, loss aversion, confirmation bias, and the disposition effect that frequently lead to suboptimal financial decisions. Overconfidence often drives investors to trade excessively and underestimate risks, which can lead to overly concentrated portfolios and unfavorable long-term investment performance. Loss-averse investors tend to hold on to losing assets too long while selling winners too early. Herd behavior also causes investors to blindly follow market trends, leading to distorted asset allocation and ill-timed decisions (Shefrin & Statman, 1985; Thaler & Sunstein, 2008).

Traditionally, financial planners used nudging and education to address these. Examples include automatic enrollment and savings plans, or alerts when investors deviate from predefined rules. However, human-based advice is costly and limited in scalability, and its impact depends on investor compliance (Benartzi & Thaler, 2004). This case study draws its foundation from scholarly work in behavioral finance and digital nudging. To ensure a balanced and rigorous analysis, both academic research and industry materials—including

peer-reviewed publications—were reviewed and integrated into the evaluation process.

AI technology is therefore emerging as a promising solution to address these limitations. Block chain-based digital assets have also attracted attention as tools that influence investment behavior by encouraging user participation (Jung et al., 2022). Rossi & Utkus (2020) found that robo-advisors mitigate behavioral inconsistencies commonly seen in human advisors, helping to reduce home bias, concentration in single stocks, and investments in high-cost funds thereby improving risk-adjusted returns

Meanwhile, digital nudging using UI/UX design and algorithms to influence behavior is gaining attention. Benartzi et al. (2007) emphasized that small design changes on digital platforms can significantly influence financial decisions. In Korea, the case of mobile wallet services also demonstrates that UX/UI can affect financial behavior. However, while digital nudges can improve investment outcomes when applied ethically, they may undermine investor protection if misused (Lee & Kim, 2015).

Beyond interface design, the structure of financial products themselves can also shape behavior. For instance, the embedded option features in loan products have been shown to significantly affect individuals′ risk perception and financial decision-making (Han & Kang, 2015). Also, However, regulatory barriers continue to hinder fintech innovation in Korea. Son et al. (2019) further noted that the lack of institutional infrastructure and the presence of regulatory constraints in Korea have hindered the creation of a supportive environment for fintech development and a strong foundation for the growth of innovative firms.

Thus, designing AI algorithms that prioritize investor welfare is crucial (Dietvorst et al., 2015). To prevent risks from biased algorithms or faulty data, ongoing human oversight and validation are essential. Han et al. (2020) suggest that certain anomalies observed in the Korean stock market—such as overreaction and momentum—may stem from data mining artifacts rather than genuine behavioral tendencies, thereby emphasizing the importance of rigorous empirical validation. The reviewed literature indicates that although the integration of behavioral finance with AI holds significant potential, its effective application requires thoughtful and deliberate design.

Ⅲ. Methodology

This study adopts a deductive, explanatory case study approach to compare how established behavioral finance theories manifest across different fintech platforms. Following Yin's (2018) multiple-case study design, this research does not seek to inductively build new theory but rather focuses on applying and illustrating existing theories, particularly Prospect Theory and digital nudging principles,

within real-world contexts. Four AI-driven investment services Betterment and Wealthfront in the United States, and Kakao Pay Securities and Toss in South Korea were selected for comparative analysis. The analysis utilizes theoretical concepts as a lens to examine how each platform addresses or mitigates investor biases, including loss aversion, overconfidence, and status quo bias. To facilitate a clear cultural- and regulatory-context comparison, two cases were drawn from the United States and two from South Korea, markets that both lead in AI-enabled finance yet differ markedly in oversight regimes.

Cases were selected through purposive sampling based on clearly defined criteria. First, each platform had to be an AI-based robo-advisor or similar service known for incorporating behavioral design or digital nudging into their user experience. Second, the selected platforms were required to have significant market prominence; Betterment and Wealthfront are leading robo-advisors in the U.S., while Kakao Pay Securities and Toss are highly influential fintech investment apps in Korea. Third, transparency of information was critical, with selected companies publicly disclosing sufficient information on their AI-based strategies and behavioral finance applications. Finally, two platforms from each country were chosen to facilitate cross-cultural and regulatory context comparisons.

Data collection was conducted entirely through desk research utilizing secondary sources. No interviews or surveys were conducted. Data primarily encompassed publicly available documents published between 2020 and 2025, including official company reports, industry analyses, academic literature, and news articles. Specific data sources and examples are detailed in Table 1.

The data analysis employed a theory-driven interpretative approach without quantitative coding or specialized software (e.g., NVivo). The researcher systematically reviewed reports and literature, identifying linkages between theoretical constructs from Prospect Theory and digital nudging and each platform's practical features. Emphasis was placed on understanding and explaining the context and methods by which platforms mitigated specific behavioral biases according to theoretical frameworks.

Triangulation was employed to enhance credibility and validity. Cross-verification of different sources (corporate, academic, and journalistic materials) was conducted to ensure consistency. Additionally, cross-case analysis was utilized to identify similarities and differences in bias-mitigation strategies across cultural and regulatory contexts. Through this process, triangulation of multiple data sources and comparative analysis across cases strengthened the reliability and validity of the study's interpretations.

Ⅳ. Fintech Case Studies

4.1 Betterment: Automated Management to Minimize Emotional Decisions

Betterment helps investors maintain consistent long-term investing by minimizing emotional involvement through its robo-advisor platform, automating principles such as dollar-cost averaging and diversification (Financial Planning Association, 2024).

This approach aligns with previous academic studies, which indicate that robo-advisors significantly reduce losses during sharp market declines compared to direct investing, improve investors' tendencies toward overtrading and biased holdings (e.g., disposition effect, trend-chasing), and enhance risk-adjusted returns through increased portfolio diversification (Liu et al., 2023).

D'Acunto et al. (2019) provide empirical support for this behavioral influence, reporting that following the adoption of robo-advisors, investors exhibited a marked reduction in overtrading and behavioral biases—such as the disposition effect and trend-chasing—while enhanced portfolio diversification led to improved risk-adjusted performance. Ultimately, Betterment's application of behavioral economics—through automated systems and digital interventions—serves to suppress emotional and irrational investor behavior, thereby supporting performance stability by encouraging a long-term investment perspective, even amid significant market fluctuations.

4.2 Wealthfront: AI-based Personalized Financial Planning

Wealthfront incorporates principles of behavioral economics into its AI-powered financial planning through three primary functionalities. personalized risk assessment, automated liquidity control, and systematic savings features (Wealthfront, n.d.). By anchoring its risk assessment framework in academic research, Wealthfront evaluates both the investor's emotional sensitivity to risk and their objective financial capacity to bear it. This methodology reduces the distortions caused by cognitive biases, promoting investment choices that are better aligned with each client's risk preferences and long-term financial goals.

In liquidity management, Wealthfront encourages users to maintain dedicated cash reserves, an approach informed by mental accounting theory. According to the behavioral life-cycle hypothesis, people segment their wealth into different mental "accounts" (e.g., current savings vs. future investments), exhibiting increased self-control over funds designated for long-term goals. By separating short-term liquidity from retirement portfolios, Wealthfront leverages this natural tendency, thus helping clients avoid impulsive withdrawals and preserving their long-term assets.

Wealthfront's automated saving feature, exemplified by its Autopilot system, leverages behavioral tools such as default settings and

commitment devices to promote more consistent saving behavior. Previous research suggests that automation effectively combats procrastination and decision inertia, as evidenced by programs in which individuals commit a portion of their future income to savings in advance. As a result, users are subtly guided toward accumulating adequate emergency savings and maintaining consistent investment habits with minimal active effort. By incorporating behavioral design principles, Wealthfront's AI-driven planning demonstrates how technological tools can effectively translate behavioral insights into mechanisms that foster sound financial practices and enhance users' overall financial well-being.

4.3 Kakao Pay Securities: Daily AI Financial Assistant

Kakao Pay Securities, launched in 2021 by Korea's fintech leader Kakao Pay, quickly gained users by promoting "everyday investing." This reflects a broader strategy among SNS companies to enter financial markets using platform familiarity and integrated services a model exemplified by Kakao, as noted by Kim & Han (2020). A key feature is the introduction of a digital financial assistant embedded in the app. In 2024, Kakao Pay launched the "Chunsik" Financial Assistant, an AI-based tool that analyzes users' financial data such as income, spending, and assets to recommend timely financial actions (Korea Economic Daily, 2024).

From a behavioral finance perspective, offering advice through casual language and characters lowers cognitive load and increases accessibility for novice investors. Kakao Pay Securities also promotes micro-investing through features like round-up investments and automated recurring contributions, encouraging users to build assets effortlessly. This approach resembles the "Save More Tomorrow" concept of Benartzi & Thaler (2004).

Importantly, Kakao Pay highlights the goal of bridging information asymmetry in Korea's financial market. The assistant helps less experienced users manage assets more systematically by identifying overlooked opportunities. For example, if a user holds excess cash, it may prompt, "Deposit rates are X%. Considering inflation, the real value is declining. Would you consider investing a portion?"

In summary, Kakao Pay Securities offers a localized model of AI-based behavioral finance, guiding users through daily financial decisions. However, over-reliance on algorithmic advice may hinder financial judgment or raise concerns about accuracy and ethics. Still, it presents a pioneering case of applying behavioral finance principles to a digital platform tailored for Korean investors (Korea Economic Daily, 2024).

4.4 Toss: User-Friendly UX and Educational Content

Toss Securities is often cited as a leading example of how behavioral economics can be

effectively applied through intuitive UX design and structured financial education to influence user behavior in a positive and constructive manner. By simplifying complex financial procedures through an intuitive interface, it minimizes users' cognitive burden. Unlike traditional securities apps that overwhelm users with numerous menus and technical jargon, Toss replaces financial terminology with everyday language, thereby lowering psychological barriers (Kim, 2023). This approach aligns with the concept of choice architecture, which focuses on structuring decision-making environments to simplify user choices and organically generate a nudging effect.

And, from the beginning of its launch, Toss Securities strategically operated a system for providing financial content. By delivering daily stock market updates and investment-related information through the app, users are repeatedly exposed to market knowledge and gradually develop independent investment judgment (Toss Blog, 2023).

Timely push notifications also are used to help users take appropriate actions when needed. Lastly, Toss's home screen has evolved beyond merely displaying information—it now functions as a platform that naturally guides users' financial behavior (Kloudy, 2025). In this manner, Toss's combination of user experience design and financial education illustrates the effective real-world application of behavioral economics within a digital financial service.

Ⅴ. Implications

A comparative summary of the platform features is presented in Table 2.

Through a comparative lens, this study categorizes the digital nudging methods applied across the AI-based platforms under review. These include setting user-friendly defaults—such as automatic enrollment in suggested portfolios—presenting information in ways that stress long-term benefits, sending timely prompts to reduce procrastination, and integrating social comparison tools that help users gauge their progress. By outlining the specific nudges embedded in each system, we show how these platforms reflect established principles from behavioral science.

This study confirms that the integration of behavioral finance and AI can effectively correct investor behavior. Based on this, several key implications are discussed.

First, AI-driven personalized interventions improve behavioral correction. Unlike traditional one-size-fits-all education, robo-advisors and fintech apps analyze vast amounts of user data to deliver timely, tailored nudges. For example, Betterment alerts users when their actions deviate from their financial plans, while Wealthfront adjusts investment strategies using ML-based risk profiling.

Second, the importance of digital behavior design is growing. Beyond AI analysis, it's essential that users accept guidance. Services like Kakao Pay Securities and Toss use friendly

UX and simple communication to lower resistance. Importantly, our analysis supports existing research on digital choice architecture, which emphasizes how user interfaces shape behavior through design. The trends identified in our case studies illustrate this idea—for example, features like default settings and timely nudges proved effective, echoing findings in behavioral finance that even small design tweaks can have a major impact on how people make investment choices.

Framing effects and delivery channels matter: users respond better to stories, visuals, or alerts than to raw data. Even app layouts that emphasize long-term goals over short-term gains can help shift investor focus.

Third, striking a balance between performance and investor protection is crucial. Although behavioral interventions can improve long-term returns and strengthen user trust, expanding algorithmic control may simultaneously introduce ethical concerns. If not carefully designed, algorithms may inadvertently exploit users—for instance, by encouraging unnecessary trading activity. To mitigate such risks, regulatory oversight and transparent system design are essential, as reflected in the SEC's 2023 emphasis on digital nudging practices.[1] Maintaining transparency in AI-driven nudging is essential to avoid crossing ethical boundaries into manipulative "dark patterns" that take advantage of investor psychology. This concern has increasingly drawn the attention of regulators. In 2023, for instance, the U.S. Securities and Exchange Commission issued proposed guidelines aimed at curbing digital engagement practices that could conflict with investors' best interests. As such techniques continue to spread, it becomes all the more important for designers and policymakers to uphold strong ethical principles and promote algorithmic clarity.

Fourth, collaboration between humans and AI remains essential. While AI is well-suited for managing routine tasks and interventions, decisions involving complexity or emotional nuance continue to require the judgment and support of human financial advisors. For example, Betterment provides access to human support when needed. Over-reliance on tech should be avoided to preserve decision-making skills and minimize system risk (Dietvorst et al., 2015).

These findings offer valuable implications for financial service providers, regulatory authorities, and individual investors. Ultimately, the advancement of digital finance extends beyond technological innovation it involves the intentional design of systems that shape and support beneficial human behavior. A summary of these discussions is presented in Table 3 below.

Ⅵ. Conclusion

This study explores how the integration of behavioral finance and AI can be applied to correct investor behavior through case-based

analysis. By examining U.S. based robo-advisors (Betterment and Wealthfront) and Korean fintech investment platforms (Kakao Pay Securities and Toss), we find that personalized advice, automated portfolio management, and strategic information delivery are commonly employed to reduce irrational decision-making and foster healthy investment habits.

More specifically, AI algorithms process users' portfolio and transaction data to identify indicators of behavioral biases, delivering real-time feedback—such as alerts or tailored recommendations—to help prevent suboptimal decision-making. These feedback systems are structured around behavioral economic nudges and conveyed through intuitive UX/UI and accessible communication formats, enabling investors to receive guidance in a non-intrusive and easily acceptable manner.

However, digital behavioral finance strategies also present certain limitations. These include risks such as excessive dependence on algorithms, technical malfunctions, cybersecurity vulnerabilities, algorithmic bias, and broader ethical considerations. Nevertheless, these risks can be mitigated through appropriate human supervision and thorough validation protocols. Ultimately, the critical factor is not the technology per se, but the manner in which it is structured and deployed. The case analyses presented in this study illustrate that thoughtfully designed applications of behavioral finance principles can improve investor outcomes and generate positive impacts within the broader financial sector.

Future studies should prioritize quantitative assessments to determine the extent to which these digital interventions lead to measurable improvements in long-term investment performance. In addition, exploring and testing AI-based strategies designed to address specific behavioral biases—such as overtrading and the disposition effect—holds great promise for future research. Moreover, the exploration of emerging technologies, including chatbots for emotional support and investment education within metaverse platforms, should be pursued to better understand their potential influence on investor behavior.

With continued collaboration between the financial industry and academia, this evolving field can significantly contribute to individual financial well-being and market efficiency.

Endnotes

[1] SEC' 2023 Focus is on digital engagement practices designed to attract and retain customers on digital platforms, as part of the 2023 examination priorities of the U.S. Securities and Exchange Commission (SEC). The SEC is a federal agency established to protect investors and ensure fair markets

References

Barber, B. M., & Odean, T. (2002). Trading is hazardous to your wealth: The common stock investment performance of individual

investors. *The Journal of Finance, 55*(2), 773-806.

Benartzi, S., & Thaler, R. H. (2004). Save more tomorrow™: Using behavioral economics to increase employee saving. *Journal of Political Economy, 112*(S1), S164-S187.

Benartzi, S., Peleg, E., & Thaler, R. H. (2007). Choice architecture and retirement saving plans. *Behavioral Science & Policy, 3*(2), 1-15.

D'Acunto, F., Prabhala, N., & Rossi, A. G. (2019). The promises and pitfalls of robo-advising. *The Review of Financial Studies, 32*(5), 1983-2020.

De Bondt, W. F. M., & Thaler, R. H. (1985). Does the stock market overreact? *The Journal of Finance, 40*(3), 793-805.

Dietvorst, B. J., Simmons, J. P., & Massey, C. (2015). Algorithm aversion: People erroneously avoid algorithms after seeing them err. *Journal of Experimental Psychology: General, 144*(1), 114-126.

Fava, D. (2024). The intersection of fintech and behavioral finance: A new paradigm for investment. *Journal of Financial Planning*. Financial Planning Association.

Financial Conduct Authority. (2020). *Evaluation of the impact of the Retail Distribution Review and the Financial Advice Market Review*.

Han, M., Lee, D., & Kang, H. (2020). Market anomalies in the Korean stock market. *Journal of Derivatives and Quantitative Studies, 28*(2), 159-228.

Han, B., & Kang, H. (2015). The history of income-contingent loans with embedded derivatives. *The Review of Business History, 30*(2), 163-183.

Jung, J., Choi, H., Kim, S., & Kim, M. (2022). Blockchain-based token reward knowledge commerce platform: Aha. *Korea Business Review, 26*(1), 67-81.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*(2), 263-291.

Kim, J., & Han, I. (2020). The strategy and key success factors of fintech business for SNS enterprise: Cases of Tencent, Naver Line and Kakao. *Korea Business Review, 24*(4), 1-19.

Kim, K. (2023). Already 5 million': 35% of Korean stock investors use Toss Securities MTS. *Bizwatch*. https://news.bizwatch.co.kr/article/market/2023/05/19/0003

Korea Economic Daily. (2024). Kakao Pay launches "Chunsik Financial Assistant": AI-powered personalized finance service. *Korea Economic Daily*. https://www.hankyung.com/article/202405070383Y

Lee, S., & Kim, B. (2015). The effects of mobile wallet services on consumer financial behavior: Focused on the N Wallet case. *Korea Business Review, 19*(1), 157-182.

Lee, S. K. (2019). *Fintech nudges: Overspending messages and personal finance management* [Working paper].

Liu, C.-W., Yang, M., & Wen, M.-H. (2023). Judge me on my losers: Do robo-advisors outperform human investors during the COVID-19 financial market crash? *Production and Operations Management, 32*(10), 3174-3192.

Kloudy. (2025). How Toss became a design powerhouse: 10 years of UX evolution. *Medium*. https://medium.com/@posinity/how-toss-became-a-design-powerhouse-10-years-of-ux-evolution-e9fc0c51d180

Rossi, A. G., & Utkus, S. P. (2020). *Who benefits from robo-advising? Evidence from machine*

learning (SSRN Working Paper No. 3552671). Social Science Research Network.

Shefrin, H., & Statman, M. (1985). The disposition to sell winners too early and ride losers too long: Theory and evidence. *The Journal of Finance, 40*(3), 777-790.

Shefrin, H. M., & Thaler, R. H. (1988). The behavioral life-cycle hypothesis. *Economic Inquiry, 26*(4), 609-643.

Son, J., Ryu, D., & Park, C. (2019). Korea's FinTech industry: Current status and suggestions for sustainable development. *Korean Association of Financial Engineering, 18*(2), 119-150.

Sunstein, C. R. (2016). *The ethics of influence: Government in the age of behavioral science*. Cambridge University Press.

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press.

Theodos, B., Simms, M., Treskon, M., Stacy, C., Brash, R., & Daniels, R. (2015). An evaluation of the impacts and implementation approaches of financial coaching programs. *Urban Institute*.

Toss Blog. (2023, March 22). Let's not give up on learning about finance. *Toss Official Blog*. https://blog.toss.im/article/outsight-financial content

Yin, R. K. (2018). *Case study research and applications: Design and methods (6th ed.)*. SAGE Publications.

〈Table 1〉 Summary of Data Sources Used in the Analysis

Source Type	Examples of Sources Consulted
Company Announcements (press releases, news articles)	- Kakao Pay Securities launch announcements (e.g., media coverage of AI investment advisor)
Official Reports & Blogs (company-published)	- Annual investor reports from robo-advisors (e.g., Betterment's published updates or regulatory filings) - Company blogs/websites (e.g., Toss Official Blog on user education, Wealthfront website FAQs)
Academic Research (journal articles, studies)	- Foundational theory literature (e.g., Prospect Theory by Kahneman & Tversky, 1979; Nudge by Thaler & Sunstein, 2008) - Empirical studies on robo-advisors (e.g., D'Acunto et al., 2019; Liu et al., 2023)
Industry & Regulatory Reports	- Market analysis and statistics (e.g., Bizwatch report on Toss user adoption) - Policy evaluations (e.g., Financial Conduct Authority review of advisory market, 2020)

〈Table 2〉 Platform Comparison

Platform (Country)	Key AI/Algorithm Features	UX/UI & Personalization	Behavioral Nudging Methods
Betterment (U.S.)	- Automated portfolio management - Tax-loss harvesting - Auto-rebalancing	- Goal-based investment planning - Simplified user interface	- Regular, automated investing (dollar-cost averaging) - Minimization of emotional trading
Wealthfront (U.S.)	- Machine learning-based risk profiling - Automated cash flow investment - Portfolio line of credit for liquidity	- Minimalist UI - Financial plans tailored to user income/spending patterns	- Default effect applied to automate savings/investments - Alerts during market volatility to encourage long-term focus
Kakao Pay Securities (Korea)	- AI chatbot "Chunsik" as a digital assistant - Behavior-based financial alerts using spending and asset data	- KakaoTalk-style intuitive interface - Micro-investing features using leftover change	- Encourages small, frequent investments - Reduces psychological resistance using characters and casual dialogue
Toss Securities (Korea)	- Data-driven investment suggestions - Fractional share trading for diversification	- Beginner-friendly interface - In-app financial content and educational materials	- Push notifications for timely decisions - Repeated exposure to financial info via main screen layout

〈Table 3〉 Before vs. After AI/Nudge Implementation

Form	Before Intervention (Traditional Behavior)	After Intervention (Observed Effects)
Betterment	- During crises (e.g., COVID-19 crash), panic selling was common - Investors often reacted to short-term volatility	- Automated investing helped reduce emotional responses - In 2020 crash: 〈2% increase in withdrawals, 26% more deposits (37% among millennials)
Wealthfront	- Manual investing led to inconsistent actions under volatility - Survey-based risk profiles often mismatched behavior	- ML-based profiling aligned strategy with real behavior - Portfolio line of credit helped avoid panic withdrawals during emergencies
Kakao Pay Securities	- Beginners lacked financial knowledge and hesitated to invest - Tendency to hold excess cash in savings accounts	- Chatbot "Chunsik" offered timely suggestions based on user behavior - Features like round-up investing nudged users into building habits gradually
Toss Securities	- Traditional apps used complex menus and jargon, increasing entry barriers - Irregular, impulsive trading behavior	- Simple UX and plain language lowered entry barriers - Daily content exposure and push alerts encouraged better financial decisions

투자자의 행동편향 완화를 위한 인공지능 기반 금융 시스템 사례 분석*

김정란** · 한병석***

요 약

행동재무학 분야는 인지 편향과 비합리적 의사결정이 개인 투자자의 투자 성과에 부정적 영향을 미치는 방식을 광범위하게 연구해왔다. 본 연구는 디지털 플랫폼 내에서 행동재무학적 통찰을 인공지능(AI)의 기능과 결합하여 투자자의 행동편향 문제를 효과적으로 다룰 수 있는 방안을 모색하고자 한다. 이를 위해 미국의 로보어드바이저 서비스인 Betterment와 Wealthfront, 그리고 한국의 핀테크 플랫폼인 카카오페이증권 및 토스(Toss) 사례를 분석하여, 실제 디지털 투자 환경에서 행동재무학 원리가 어떻게 적용되고 있는지를 살펴보았다. 연구 결과, 맞춤형 인공지능 기반 투자 가이드, 자동화된 포트폴리오 전략, 디지털 넛지(digital nudging) 기법 등이 과신 편향과 손실회피 편향과 같은 인지적 편향을 효과적으로 완화하는 데 중요한 역할을 수행할 수 있음을 확인하였다. 이러한 복합적 전략은 보다 안정적이고 합리적인 투자 행동을 유도하여 장기적인 금융 성과를 개선하는 데 기여할 수 있는 상당한 가능성을 보여준다. 또한 본 연구에서는 인공지능 기반 디지털 행동재무 전략의 실제적 시사점과 한계점을 논의하고, 향후 연구 방향을 제안하였다.

주제어: 행동재무학, 인공지능(AI), 핀테크, 로보어드바이저, 디지털 넛지

* 본 논문에서 분석된 플랫폼으로부터 어떠한 재정적 지원을 받지 않았음을 밝힙니다.
** 한양대학교 경영학부(kimjungran2012@gmail.com), 제1저자
*** 한양대학교 경영학부(bhan@hanyang.ac.kr), 교신저자

〈Teaching Note〉

A Case Analysis of Artificial Intelligence-Based Financial Systems Aimed at Mitigating Investor Behavioral Biases

Ⅰ. Synopsis

WealthWise is a conceptual fintech app project designed to address irrational investor behavior by integrating core insights from behavioral finance with AI-driven features. Drawing inspiration from successful real-world platforms (e.g., Betterment, Wealthfront, KakaoPay Securities, Toss), the project showcases how intelligent nudges, automation, and user-centered design can help investors overcome biases like loss aversion, overconfidence, present bias, and herd behavior. In this case assignment, learners take on the role of fintech innovators, developing app features that guide investors toward more rational, long-term financial decisions.

Ⅱ. Learning Objectives

1. Identify common behavioral tendencies that affect financial decision making

Understand how biases like loss aversion overconfidence present bias and herd behavior shape investor actions and results.

2. Apply concepts from behavioral finance to practical investment situations

Explore how digital nudges and user centered design can help reduce cognitive mistakes using examples from well known fintech platforms.

3. Integrate AI Tools

Investigate the capacity of artificial intelligence including machine learning and natural language processing based systems to provide individualized and immediate feedback capable of mitigating errors arising from cognitive biases.

4. Design User-Focused Solutions

Examine the process of designing fintech application features including goal based planning automated investment mechanisms and socially driven comparison alerts with an emphasis on user needs and ethical frameworks.

5. Develop Clear Communication

Enhance presentation and storytelling skills to convincingly convey the logic behind each proposed digital solution ensuring both technical and conceptual clarity.

Ⅲ. Target Audience and Courses

The present case is intended for individuals with interdisciplinary academic backgrounds particularly those engaged in the study of finance technology and psychology. It seeks to integrate established theoretical constructs with the practical development of user oriented digital interventions.

1. Undergraduate or Early Graduate Students

Particularly in finance, fintech, information systems, marketing, or behavioral economics courses.

2. Courses

A. Behavioral Finance
B. Fintech Innovation & Entrepreneurship
C. User Experience Design in Financial Services
D. AI Applications in Business

Ⅳ. Case Questions

1. Behavioral Biases

Which investor biases are most commonly addressed by fintech apps, and why do these biases pose significant challenges in real-world investment decisions?

2. AI Integration

How can AI tools (e.g., machine learning analytics, NLP-based chatbots) be effectively leveraged to detect and correct irrational behaviors?

3. Feature Feasibility

Among the eight suggested WealthWise app features, which do you consider the most critical to implement first, and what factors influence their feasibility and effectiveness?

4. User-Centric Design

How can UX/UI principles like visual future simulations or friendly chatbot characters enhance user engagement while reducing investor resistance to behavioral corrections?

5. Ethical & Regulatory Concerns

What ethical or regulatory pitfalls might arise from using AI nudges in financial platforms,

and how should they be addressed to protect and empower users?

Ⅴ. Case Analyses and Key Concepts

By examining core theoretical constructs alongside applied examples this case provides a comprehensive perspective on the integration of behavioral finance and artificial intelligence in shaping individual investment behavior while enhancing both financial performance and user engagement.

1. Core Behavioral Finance Principles

A. **Loss Aversion**: Refers to the tendency of investors to react more strongly to potential losses than to equivalent gains which often results in holding onto losing assets or selling winning ones prematurely.
   - *Digital Example*: The long term performance framing strategy employed by Betterment which mitigates investor anxiety associated with short term market volatility.

B. **Overconfidence**: Traders often overestimate their ability, resulting in excessive trading and under-diversification.
   - *Digital Example*: Periodic AI-generated performance reports comparing user returns to benchmark indices.

C. **Present Bias** : A preference for immediate rewards over future benefits impairs long-term saving.
   - *Digital Example*: Goal-based planning with future self-visualizations and automated savings reminders.

D. **Herd Behavior**: Following market trends or social signals without due diligence, fueled by FOMO.
   - *Digital Example*: Real-time alerts indicating potential overhyped stocks, with cautionary notes.

2. AI and Digital Nudges

A. Machine learning enables the generation of individualized risk evaluations and the delivery of timely alerts derived from behavioral user data.

B. Natural language processing based chatbots provide context aware guidance and emotional reinforcement designed to prevent impulsive financial decisions.

C. Automation and Smart Defaults : Round up investing automated portfolio rebalancing and passive cash allocation mechanisms function as default strategies that reduce the likelihood of detrimental manual interference in investment behavior.

3. Feature Design Considerations

A. User Experience UX: Simple interfaces visual supports and sequential guidance are employed to enhance user engagement and reduce cognitive friction.

B. Streak based incentives interactive quizzes and achievement systems are utilized to encourage sustained engagement and facilitate continuous learning.
C. Opt out mechanisms data privacy measures and algorithmic transparency are essential in establishing and maintaining user trust.

4. Implementation and Practicality

A. Beginning with persona mapping and progressing through iterative prototype testing each stage ensures alignment between feature design cognitive bias mitigation and user centric objectives.
B. Beginning with persona mapping and progressing through iterative prototype testing each stage ensures alignment between feature design cognitive bias mitigation and user centric objectives.

5. Real-World Case Insights

A. Emphasize automated, low-cost investing and AI-driven rebalancing.
B. Showcase localized chatbots, gamification, and simplified UX targeting younger demographics.