Joakim Perälä

Gamified Investing

Impact of gamification on retail investor behavior

School of Accounting and Finance
Bachelor's thesis
Finance

Vaasa 2025

UNIVERSITY OF VAASA
School of Accounting and Finance
Author: Joakim Perälä
Title of the Thesis: Gamified Investing : Impact of gamification on retail investor behavior
Degree: Bachelor of Science in Economic and Business Administration
Programme: Finance
Supervisor: Anupam Dutta
Year: 2025 **Sivumäärä:** 34

ABSTRACT:
Tämä tutkielma tarkastelee pelillistämisen vaikutuksia piensijoittajien käyttäytymiseen. Tutkimuksessa keskitytään siihen, miten pelillistetyt elementit, kuten palkinnot, tulostaulut, visuaaliset vihjeet sekä erilaiset edistymistä kuvaavat graafit vaikuttavat sijoittajien päätöksentekoon, riskikäsitykseen ja yleiseen markkinakäyttäytymiseen. Hyödyntäen käyttäytymistaloustieteen teorioita ja empiiristä kirjallisuutta tutkielmassa tarkastellaan, miten heuristiikat, kognitiiviset vinoumat ja psykologiset mekanismit vaikuttavat sijoittajiin digitaalisissa sijoitusympäristöissä, mahdollisesti aiheuttaen impulsiivisuutta, yli-itsevarmuutta ja laumakäyttäytymistä. Tutkielman keskeiset hypoteesit esittävät, että pelillistäminen vahvistaa käyttäytymisen vinoumia, kannustaa riskialttiiseen sijoittamiseen ja haastaa perinteisiä rahoitusteorioita, kuten tehokkaiden markkinoiden hypoteesia (EMH).

Aikaisempaa tutkimusta ja tosielämän esimerkkejä kuten GameStop Short Squeeze -tapausta kriittisesti analysoimalla tutkielma löytää vahvaa näyttöä sille, että pelillistäminen vaikuttaa yksittäisten sijoittajien käyttäytymiseen sekä laajemmin markkinoiden tehottomuuksiin. Tulokset viittaavat siihen, että pelillistetyt sijoitusalustat vähentävät rationaalista päätöksentekoa, edistävät tunteisiin perustuvaa kaupankäyntiä ja tekevät sijoittamisesta viihteellisempää toimintaa. Tämä kehitys korostavaa tarvetta ymmärtää pelillistämisen pitkäaikaisia vaikutuksia rahoitusalalla sekä sijoittajakoulutuksen ja sääntelyn merkitystä digitaalisissa sijoitusympäristöissä.

KEYWORDS: Gamification, Behavioral Finance, Retail Investors, Fintech, Investor behavior, Decision-making, Risk-taking, Risk-tolerance

Contents

1 Introduction

In recent years gamification has risen to be a significant factor in several fields such as education, healthcare and marketing. Financial markets have also seen the effects and impacts of gamification and has started to raise interest, especially amongst retail investors. Financial technology and digital platforms such as Robinhood utilize elements of gamification for example with point systems and interactive user interfaces. This aims to make investing through those platforms more encouraging and user friendly. This raises the question of how gamification affects investor behavior, especially risk aversion.

Retail investors, those with commonly less knowledge about the markets and lower levels of capital compared to institutionalized investors, can succumb to the effects of gamification in a different way. In behavioral finance retail investors can be seen taking more risk due to gamification. Gamified investing can lead to more impulsive decision-making and risk-taking, which can lead to short-term investment decisions and possible significant losses. On the other hand, gamification can also improve financial literature and learning as well as interest towards economic decision-making.

This thesis will look at how gamification impacts retail investors. By reviewing existing literature, the thesis delves into what gamification is and what it implies, what effects it can have on investors and how different investment platforms aim to increase and encourage or discourage retail investors' risk taking with gamified elements.

1.1 Hypothesis

The purpose of this study is to examine how gamification and game elements affect retail investors and their financial behavior. The thesis will be looking at the impact of gamification and the changes it can have on investor behavior and motivation through the following hypothesis (H).

Gamification has become a powerful tool across various fields, from education and healthcare to marketing and finance. By incorporating game-like mechanics such as rewards, competition, and instant feedback, gamification has been shown to influence human behavior, particularly in decision-making and risk-taking. Psychological theories suggest that incentives and immediate reinforcement can alter how individuals assess probabilities and potential outcomes, sometimes leading to irrational or emotionally driven choices.

> H1: Gamification increases individuals' willingness to take risks by making decision-making environments more engaging and immersive.

The use of rewards, progress tracking, and competition in gamified environments can lower psychological barriers to risk-taking. When decisions are presented in a game-like context, individuals may perceive risk as less threatening or may become overconfident in their choices due to reinforcement mechanisms. This effect has been observed in areas like online gambling, financial trading, and consumer behavior, where gamification encourages users to make quicker and riskier decisions.

Retail investors differ from institutional investors in that they often make decisions based on emotion, heuristics, and social influence, rather than purely rational analysis. The rise of gamified investment platforms has further amplified these tendencies by introducing elements such as performance graphs, rewards, badges, and visually stimulating interfaces. These features have the potential to reshape risk perception, encourage short-term trading, and alter traditional investment behavior.’

> H2: Gamification elements such as graphs, rewards, and visual cues (e.g., price movement colors) amplify investor biases, leading to increased impulsivity and overconfidence.

By tapping into psychological drivers like competition and instant gratification, gamified platforms can lead investors to trade more frequently, overestimate their skill level, and engage in riskier financial behavior. For example, real-time ranking systems may push individuals to take excessive risks to improve their perceived performance, while visually engaging notifications can reinforce impulsive decision-making rather than deliberate investment strategies.

Traditional finance theories, particularly the Efficient Market Hypothesis (EMH), assume that investors act rationally and that markets reflect all available information. However, research in behavioral finance has shown that investors are subject to cognitive biases that drive irrational market behavior. Gamification introduces new psychological mechanisms that may further deviate investor behavior from EMH assumptions, questioning the rationality of market participants.

> H3: Gamification challenges the assumptions of EMH by increasing investor irrationality, leading to market inefficiencies driven by emotional and behavioral biases.

The introduction of gamified mechanics into investing may create excess volatility, herd behavior, and speculative trading, all of which contradict the EMH premise that prices reflect fundamental value. Retail investors, influenced by gamification-driven engagement loops, may act based on emotions, social comparison, and heuristics, rather than rational decision-making. This raises important questions about whether gamification is distorting financial markets and leading to inefficiencies that traditional models fail to predict.

1.2 Structure of the thesis

The motivation behind this thesis is discovering the different ways financial technology companies utilize gamification on their digital platform to affect users' behavior in a way

that support the companies' goals and objectives. To achieve this, the thesis is structured as follows:

First, this thesis defines the terms and theories that will be part of this study. Focusing on the characteristics and elements of gamification as well as behavioral finance theories and phenomena that can be associated with gamification with a focus on retail investors and their behaviors. This includes a closer look at the definition of gamification, its elements and common uses as well as an overview of behavioral finance theories and aspects closely related to gamification for example heuristics. Psychological biases that can be amplified with gamification mechanics and heuristics derived from known game elements.

Next the thesis will delve into the existing literature on gamification. Its implications in financial services and technology, particularly in the context of the research questions and hypothesis. The purpose of this literature review is to shed light on previous findings on the effects of gamification in different contexts and then dialing it back to investor risk-taking, decision-making and financial literacy of retail investors.

Finally in the end, the thesis will discuss the findings and analyze them in a critical manner. This section explains the data collection methods, research design and analytical framework used in this thesis. Possible potential future research and ending with a definitive conclusion of the effects and impacts of gamification.

2 Theoretical Background

2.1 Gamification

Gamification is the act of bringing game design elements into non-game contexts (Deterding et al., 2011) emphasizing its role in motivating users rather than just replicating games. Hamari and Huotari (2017) expanded this thought by framing gamification in a service marketing perspective and focusing on the enhancement of user's value experience. Thus, gamification can be understood as both the integration of game elements and the broader process of creating user value.

Common game elements include points, levels, leaderboards, progress bars and performance graphs. These elements can be found in various contexts such as education, healthcare and finance, highlighting their versatile potential applications in influencing behavior. Previously associated with terms like "serious games" and "playfulness", the Deterding et al. (2011) study found that gamification shouldn't be seen just as the use of game elements in non-game contexts but as means of motivating users.

As these gamified elements have become more established, digital investment platforms have started to use them to enhance user engagement and lower the barrier to entry the markets. This development can be better understood by examining the specific elements and mechanics of gamification.

2.1.1 Elements

Elements of gamification have been implemented in firms for several years with for example incentive programs. These elements include things like competition between colleagues, ranking-leaderboards and different kinds of badges (Robson et al., 2015). These elements can be divided into three types according to Bayuk and Altobello (2019): website, process-related and social-related. The first type includes the visuals, for

example the game characters and things such as badges. The second type, process-related things includes information about the user's progress and indications of reached goals for example. Social-related elements include the interactions between users such as teamwork or gift-giving.

Leaderboards are visual scoreboards displaying information such as a user's name, their team, their points as well as possible information about the user's opponents. Leaderboards can often be used to create and display competition between users. Badges aim to display a user's memberships or achievements. Badges can be attained through participation or accomplishments and can sometimes aim to separate groups of users from each other, for example those who have participated in an activity and those who have not (Cardador et al., 2017).

A study by Bitrían et al. (2019) state that game elements should make users "feel competent and self-determined", saying that the design of financial applications should deduce self-motivation as well in individuals. Additionally, the ability to customize and personalize these applications would lead to more autonomous use of the apps and promote feelings of competence and improve financial literacy. Another study done by Bayuk and Altobello (2019) states that gamification and specifically the presence of game elements can increase user engagement through motivation. Gamification must be implemented carefully however because gamified elements can also cause demotivation which is tied to the underlying game mechanics.

2.1.2 Mechanics

Mechanics are defined as ways and rules that specify as well as outline the decisions wishing to gamify. Mechanics in the use of these elements of gamification can be sorted into three different categories. Elverdam and Aarseth (2007) define these categories as setup mechanics, rule mechanics and progression mechanics. The first one, setup mechanics, describes the environment of the experience, aspects such as competition

and the setting. Rule and progression mechanics aim to shape the goal of the gamified experience as well reinforce the feeling of progression during the experience. This progression can be reinforced with elements like point systems and achievement rewards and be signaled with a progress bar, like often seen in video games with any type of progression.

Implementing gamification and the underlying mechanics can be seen in some workplaces. By gamifying, a company can aim to make tasks more pleasurable and provide ways for employees to access work related performance information (Cardador et al., 2017). With this kind of gamification, a company strives to improve employee efficiency by provoking their self-motivation through game elements and mechanics. Understanding these mechanics is critical when trying to analyze how gamified systems affect user behavior, especially in the investing context and environments such as digital investing platforms.

2.2 Behavioral Finance

Behavioral finance is an area of study focused on psychological effects and influences on the financial markets. Traditional finance assumes that investors, institutions and even markets are rational and this assumption feed into the Efficient Market Hypothesis (EMH) which states that the markets are efficient and all available information is reflected on the stock prices (Fama, 1970). This implies that investors are rational beings and that the markets do not have pricing errors. Behavioral finance challenges this way of thinking by stating that investors are not rational in the way they do things but rather irrational beings who base their decisions often on feelings, heuristics and cognitive biases (Kahneman & Tversky, 1979). To better understand investor behavior, it is important to understand behavioral finance and its concepts.

2.2.1 Heuristics

Heuristics can be thought of as “rules of thumb”, and they are used in the decision-making process to quickly and efficiently make decisions during moments of uncertainty (Piotrowski & Bünnings, 2024). Kahneman and Tversky (1979) determined that people are not only irrational but tend to be affected by heuristics, particularly in financial decision-making. Heuristics simplify complex problems by providing informal and intuitive ways of problem-solving. The three main heuristics that the following section will be focusing on are the anchoring, availability and affect heuristics.

People often rely too much on the first piece of information they hear, this is called anchoring. With new information coming out, people that have anchored their opinion on a subject tend to have a hard time adjusting. An example of this is when investors use a previous stock price as an anchor and disregards news about the company’s worsening financial situation to merely think the descend in price is only a “discount”. Kahneman and Tversky (1974) give another example of anchoring where people are given a randomly selected initial value from 0 to 100 to determine a final percentile value a statistic such as “the percentage of African countries in the United Nations”. What they found was that the random value given to the subjects had a significant effect on the final estimate the subjects gave, representing the anchoring effect the given initial value had on the subjects. Anchoring in the gamification context could be seen as, for example the presenting of historical numbers and profits of a fund and relying on history repeating itself. Platforms can try to steer investors from bad news to a positive track record and towards investing even during harder times.

The second heuristic is the availability heuristic. According to Kahneman and Tversky (1974), with the availability heuristic, information that is readily available and seems intuitive has greater weight than information that is more abstract and harder to justify. The occurrence of an action is weighed relative to its presence in recent memory for example, something seen in the news or social media. While the availability heuristic

serves as a useful cognitive shortcut it can be manipulated through marketing to highlight certain information. This manipulation can lead to availability bias, where systematic errors in judgement occur. An example of this heuristic in a gamified finance context would be increasing a well-performing stock's exposure to influence investor behavior and drive trade volumes up.

Affect heuristic describes the decisions made with established feelings and emotions on the matter rather than rational analysis (Piotrowski & Bünnings, 2024). The core thought is that people make decisions based on their existing feelings about the subject. An example of this heuristic is when an investor's choice to invest in a fund that focuses on sustainable energy is fueled by the need to support sustainability rather than investing in a more profitable fund that includes petroleum companies. Affect heuristics are used in investment advising to present investments as safe and responsible. This can be seen represented on gamified platforms as things like green leaf badges of sustainability and confetti celebrations after completed trades. While these heuristics simplify decision-making, trusting these heuristics too much can result in systematic errors and lead to cognitive biases.

2.2.2 Cognitive biases

If a heuristic can be thought of as a rule of thumb in decision-making, then cognitive biases can be explained as systematic patterns deviating from rationality. Although heuristics and cognitive biases are linked to each other, it is important to understand that heuristics can lead to cognitive biases, but they are not the same. For example, availability heuristic is the rule of thumb for reviewing the probability of an action through previous experience when availability bias is the systematic error in one's thought process due to an action or an event has been visible in recent media. Believing that the entire technology sector is doing well because high-profile tech companies such as Facebook or Amazon have recently gained media coverage for record-breaking quarters, would be an example of availability bias on the other hand.

The most important cognitive biases that this thesis will be looking into have direct applications in gamified investing and digital platforms. These biases include confirmation bias, framing bias, overconfidence bias and herding bias.

Confirmation bias is the predisposition to value existing information and sideline conflicted information. Ignoring information and selectively choosing what to believe in, individuals promote distorted decision-making and errors in rationality. According to Nickerson (1998), confirmation bias refers to one's interpretation of information that supports existing beliefs and views. A trader following information and analytics whose views best align with theirs is likely to underestimate risks and not diversify properly. Gamified platforms intentionally use algorithms to reinforce confirmation bias to support a user's views and to push supportive articles while limiting exposure to alternate perspectives (Rai & Murphy, 2023).

Another major bias is framing bias, where the decision-making depends largely on the way a problem or choice is formulated. Framing a potential investment as "achieving profits of over 20% in three out of four years", compared to "experiencing a negative 20% loss once over four years" illustrates how presentation can influence perception. According to Kahneman and Tversky (1981), people prefer riskless prospects over risky prospects with equal expected value. Gamified digital platforms can intentionally aim to frame investing as a game-like action, and therefore make investing feel more notably more enjoyable and less risky (Lieberoth, 2015).

Overconfidence is the tendency to overestimate one's ability to predict market movements. According to the portfolio theory, rational investors diversify their portfolios to minimize risk and maximize profits (Markowitz, 1952). Overconfidence deviates from this theory as overconfident investors think they can pick the best stocks and outperform the market which can lead to poorly diverse portfolios, excessive risk-taking and costly trading behavior. Gamified investment platforms can further reinforce overconfidence

by rewarding frequent trading and highlighting short-term profits and success, increasing investors' belief in their superior market skills.

There is always increased risk when market analysis is neglected. Herding bias describes the tendency of an investor to imitate and copy the actions of a larger group without doing proper research themselves. An example of herding was seen in early 2021 when the so-called GameStop short squeeze happened. The short squeeze showcases a coordinated movement by retail investors that created extreme volatility and significant market disruption (Stiebel, 2022). The original small group of redditors garnered a cult-like following and as the movement gained publicity, many previously uninvolved people started investing in GameStop stock, showcasing extreme herding behavior (Stiebel, 2022). Many investors were making investment decisions based on the opinions and doings of others, sense of community and social pressure and this speculative and irrational trading caused very high volatility.

Gamified platforms can amplify herding behavior through gamified elements, by creating visible signals of group actions and encouraging communality. These patterns of emotionally driven and socially influenced behavior highlight the need to understand investor behavior especially under risk and uncertainty, which the Prospect Theory seeks to explain.

2.2.3 Prospect Theory

The heuristics and cognitive biases discussed show us how investors' decision-making processes often deviates from rational models. Prospect Theory, developed by Kahneman and Tversky (1979), offers a comprehensive framework to explain these deviations systematically.

As mentioned, people are irrational and can be affected by feelings, heuristics and cognitive biases. This irrationality can lead to phenomena such as overconfidence,

herding and loss aversion. Kahneman & Tversky (1979) sum this up in with Prospect Theory (PT), a theoretical framework for how people make decisions during times of risk and uncertainty. According to the Prospect Theory, people hate losing more, for example 100 euros than winning 100 euros. This is called loss aversion. Another concept situated with PT and loss aversion is “getting eventies”. This concept describes a situation where, for example an investor is determined to take substantial risks to avoid a sure loss in the hope of getting even. On the other side, when an investor is on a profitable investment, they tend to sell off their positions early leaving potential profits on the table. This is because the pain of losing is greater than the joy of winning. Investment platforms like Robinhood can amplify this feeling by using gamification and elements such as red, negative feeling indicators on stocks that are not performing well. These tendencies are important to study due to the increasing amount of investors on digital investment platforms.

2.3 Retail investors and Fintech

Retail investors have garnered a lot of power on the market during the last decade riding the growth and development of financial technology and digital investing platforms. Bringing the advanced tools, once thought to only be exclusive to the big institutes, to the masses and enabling improved financial literacy. In addition to increased financial literacy, the amount of retail investors has risen overall, and the markets are seeing the effect of the increased amount of trade. The effects of gamification are increasingly important to study as they aim to influence the behaviors of the growing number of investors.

2.3.1 Why is the behavior of retail investors worth studying

The retail investor is a person who invest small to medium sized amounts into stocks, funds and other instruments like bonds. Typical characteristics associated with the retail

investor are decision-making driven by “a mix of financial aspirations, information consumption and behavioral biases” (Bingqiao et al., 2024). The difference between retail investors and institutions is that institutions usually manage larger amounts of money and often invest into various wealth classes with the biggest difference being the institutes’ use of more complicated investment strategies such as the use of derivatives, options and algorithms to hedge their positions and secure cashflows (Minton & Schrand, 2016). Retail investors are also more prone to be influenced by gamification as they act more irrationally and as we know, base their decisions more on feelings, heuristics and biases.

A study by Einhorn et al. (2023) found that during the Covid-19 pandemic years approximately 30 million new retail investors opened a brokerage account in the US. With the development and enhancement of digital platforms with zero transaction costs, such as Robinhood, the amount of money pouring into the stock market has increased. Studying the effects of gamification on these new investors is important as fintech companies want to continue to increase trade volumes and attracting investors by using game elements and mechanics on their platforms. The increased number of investors on these platforms can also lead to biases like herding and with zero transaction costs, investors can affect the market with mass trading, leading to increased volatility, as in the case of GameStop (Stiebel 2022).

2.3.2 Evolution of financial technology

Financial technology is one of gamification main channels of behavioral influence. Financial technology, or Fintech, points to the digitalization of financial services and innovations to utilize in banking and investing. Financial technology has seen growth with new investors landing on their platforms. With zero transaction costs, more available and faster services like mobile apps as well as automated investments counseling and social and gamified opportunities leading positive and negative effect on investor behavior on the market. The most important characteristics and what they use

to affect are zero transactions costs, user friendly user interface and gamified elements such as challenges leaderboards and reward systems drive the investing process to be more interactive and game-like.

An example of gamified investing is copy trading. Investors can follow others' investing moves and copy them. This type of copy trading has been seen on platforms like eToro and is attractive due to its simplicity. A US based company called Autopilot has also gained attention with copy trading, and their business model is simple, an investor can easily follow the top American stock traders' moves and invest like them (Autopilot). Copy trading is a great example of gamified investing as it makes it easy for the retail investor to invest into the market without fundamental analysis of their own.

This type of gamification, as well as real time market information, make investing on digital platforms easy and enticing for the retail investor. Zero costs motivate investors to trade more frequently, which in turn promote retail investors to try and beat the market. This type of active and overconfident investing goes against the Efficient Market Hypothesis (EMH) but while some portfolio managers and investors can beat the market, the EMH points to the fact that most investors underperform (Fama, 1970).

The evolution of these digital platforms has created a more reachable and user-friendly infrastructure that is not only easy to use but cheaper as well. Financial technology companies have brought market access closer to the retail investor and increased financial inclusion (Bhatnagar et al., 2022). This has increased risk-taking and impulse prone behavior in investors along with social media and investing platforms. These new investors are vulnerable to gamification on these platforms as gamification's use is just one way fintech companies are striving to affect retail investors.

3 Gamification and Its Influence on Retail Investor Behavior

This thesis will be looking to enlighten the different perspectives of gamification in different contexts and then dialing the literature more into the financial and investing aspects. Psychological and behavioral effects as well as their influence on market efficiency and the rationality of the investor are going to be the key points with complementary theories on the side. First, the thesis will be looking at existing literature on gamification in contexts such as education. After establishing a solid foundation for the effects of gamification, the thesis will focus more on the retail investor and how gamified elements can affect things such as risk-taking in decision-making. Third, the thesis will compare those findings and existing literature to classic financial theories such as the Efficient Market Hypothesis (EMH). After all that the thesis will comprise the key findings and critically analyze the existing literature to find possible gaps for future research opportunities.

3.1 Gamification as a tool for behavioral influence

Gamification is a diverse psychological tool used to affect decision-making in contexts such as education, healthcare and finance. Using tools like leaderboards and progression bars as well as instant rewarding. Rewarding is important part of gamification, and it heavily correlates to users' relationship with the gamification system (Zhao & Guo, 2019). Another study done on hospitality and tourism organizations, investigated the connection between gamification and workplace thriving. What the study found was that applying gamification into work tasks and turning them into kind-hearted competitions boosted individual worker's motivation and productivity (Khan et al., 2024). These papers suggest that gamification can have remarkable effects on people's behavior.

3.1.1 Decision-making

A literature review by Fernando and Premadasa (2024) on the use of gamification and game elements in education found that studies show the best way to take advantage of gamification and game elements was to implement several kinds of game elements rather than just single ones. For example, using a leaderboard by itself is not as effective as implementing rewards based on the leaderboard. The purpose of Fernando and Premadasa's paper was to find out how gamification can best be utilized in the educational systems for generation alpha. People of generation alpha are considered to include those born after the 2010s and are considered "digital natives". Generation alpha is generally considered strongly reliant on digitalization, mobile phones and gaming, providing a gamified learning experience can be of great use and will be a central part of their educational journey, according to Fernando and Premadasa (2024).

According to another study, Jones et al. (2014) studied if using gamification would increase the consumption of fruits and vegetables in children aged from kindergarten to 8th grade. The narrative behind the study was that consuming fruits and vegetables was going to help superheroes achieve their goals and what the study found was that this kind of gamified narrative and environment promoted a significant increase in consumption. Showcasing the power of gamification in influencing decision-making without the traditional financial incentives.

Gamification affects decision-making in two primary ways. First, it increases commitment and repeatability. Progress bars and a goal-orientation as well as social pressure and competition. Second, it lowers the psychological barriers in the decision-making process. The study found that precisely these type of mechanisms like social pressure and competitiveness that influence the decision-making of students in school can be taken out of this context and seen in investment decision and consumption behavior. A discovery this study also made was that even after the intervention for this study was made, the behaviors and approaches that were stimmed from the created gamified environment stayed (Jones et al., 2014). This could signal that gamification

promotes the internalizing of new habits. In a gamified investing context, this could mean that digital platforms can alter investor behavior also in the long-term by making high-risk investing more appealing.

3.1.2 Risk-taking

One of the hypotheses for this thesis' research was that gamification can increase people's willingness to take more risks and act impulsively. Risk-taking is important to look at because when we are talking about investing and especially retail investors putting their money in the market, there is always a risk of losing the money they invest. Gamification's effect on the willingness to take more risk in such manner as well as how people perceive this risk is important to understand.

A paper studying gamification and gaming's effects on promoting risk-taking in language learning process (Shatz, 2015) found that taking increased risks in language learning boosted performance on tasks, increased self-confidence and reduced anxiety. The paper references another study which found that gamification had the advantage of making the "cost of making an error" lesser and thus promoting more risk-taking (Sombrio et al., 2014). An example of gamification implemented in the learning context is the learning application Duolingo. Duolingo is a free application designed for easy language learning where the user climbs up a progression tree by completing increasingly harder levels and earning rewards along the way. A study done on Duolingo and its' successful implementation of gamification found that there is a definite positive effect on the user's learning (Garcia, 2013). The paper by Shatz (2013) concluded that the successful use of gamification benefited learning by making risk-taking more desirable.

Based on the research done on gamification in contexts such as education and learning, we can say that they support our hypothesis about the effects of gamification in decision-making and risk-taking. Going into the literature about gamification in the investing

context, there is credible research to support our hypotheses that gamification and game elements can have significant effects on investor behavior and its role in challenging the traditional financial theories like the EMH.

3.2 Amplified risk-taking and cognitive biases in gamified investing

Knowing that gamification can have an impact on a subject's behavior and perception of risk is a significant finding as risk-taking and risk tolerance is a considerable part of investing. Shedding light on the impact gamification can have on investors and understanding possible cognitive biases that digital platforms can use to attract investors as well as make them vulnerable to increased risk.

3.2.1 Interactive design

Online investment platforms like Robinhood for example, use different colors to represent things such as stock performance and a study by Bazley et al. (2021) found that the use of green and red colors is commonly used by a variety of brokerages and platforms. Green color commonly representing positive returns and red color representing negative returns. These visual cues can have meaningful effects on investors as Bazley et al. (2021) found that coloring potential losses in red in comparison to plain black and white style, led to increased risk aversion amongst investors. During market downturns, the color red often visualizes losses and declines and can lead to a heightened state of risk aversion (Bazley et al., 2021).

Other game elements often seen on trading platforms include trackers, rewards as well as progression and performance graphs. An example of a tracker is a movers chart element on investment platforms. This element commonly presents the 20 best performing stocks of the day visualizing the change in stock price since the previous day's closing price (Barber et al., 2020). A study by Moore and Ljungkvist (2022) found that a

movers chart doesn't necessarily promote hasty decision-making but rather increased collection of information regarding the changes on the market. Movers charts can be used as a filter for potential investment opportunities.

The previously mentioned color cues such as the green color indicating profits can be seen as a rewarding feature on its own but rewards can be much more than that. Rewards can be thought of as something achieved after a positive action is done. Rewards can also be used to boost and nudge traders to execute even more trades on the platform in the form of cash benefits.

On Nordnet's platform, frequent trading is incentivized via 4 level reward system where there more you trade in a given period, in this case a month, the lower your transaction costs for the next month's trades are going to be. For example, if an investor makes 11 to 50 trades in a given month their transaction costs for the next month will be a minimum of 5 euros or 0,10% of the total amount with trades done in the Helsinki Stock Exchange (Nordnet). In a study carried out by the Ontario Securities Commission found, that traders that were rewarded with points exercised 39% more trades compared to a control group exposed to the same trading simulation but without this gamified element of rewarding. Despite the points having no intrinsic value, the increase in trading volume is statistically significant (ONC, 2022).

3.2.2 Impulsivity and overconfidence

This type of increase in trading volume could be a sign of increased impulsivity as well as a sign of overconfidence in traders when gamification is applied to investing and investment platforms. Gamification creates scenarios where trading can be quick, more frequent and made with less consideration. A study by Packin et al. (2024) examined how visual cues, rewards and ranking systems can affect and reinforce impulsivity of investors. The study found that visual cues such as confetti, colors and sound effects can increase impulsivity and having ranking systems, or leaderboards, in the other hand can

strengthen investor's overconfidence bias. Elements such as these activate reward systems in investor's which remind the way gambling affects player's and can lead to decision-making that is based off impulse rather than careful consideration and rationality.

Packin et al. (2024) call this implementation of game elements on these platform "gamblified finance" due to gamifications effects being similar to gambling. A successful trade can make an investor believe in their ability to beat the market and think that they are superior to others. The social effect and comparison on rankings and leaderboards alike can increase competitiveness which in turn can cause investors to take more risks to show off their trading ability. Push-notifications and continuous supply of market information on top of this competition can subconsciously boost emotional trading and steer investors to impulsive behavior. These mechanics can easily lead to investor overconfidence subsequently raising risk-taking and exposing investors to high-risk situations.

This transformation of rational investing into more irrational and impulsive trading challenges the traditional finance way of thinking of rationality and careful consideration and brings forth the need to examine the effects of gamification on not only investor behavior but on the markets as well.

3.2.3 Risk perception and tolerance

As discussed in literature, gamification can have an immense effect on the behaviors of investors. Altering the perceived risk of investments and producing emotions of safety control are fintech companies' ways of using gamification to drive increased amounts of cash flow on their platforms. Pushing to provide a false sense of security with products and instruments that can be very risky and can lead to situations where the investor doesn't perceive the true nature of the risk that they are taking (Packin et al., 2024). Going back to what Bazley et al. (2021) found examining the effect of visual cues, Packin

et al. (2024) give support with their findings as both conclude that visual elements are not neutral elements by any means but have a definitive part in guiding the investors' risk assessment through impulsive and emotion driven decision-making.

The threshold for taking risks in investing can be lowered through gamification and investors' do not perceive these risks the same way a rational investor that is not affected by gamified elements. Gamified platforms can also aim to promote certain high-risk instruments to investors' that are not as experienced as maybe they should be. These different charts and graphs combined with visual elements such as positive feeling green arrows announcing good results shift the investors' focus from long-term investing to short-term, fast gains in the market and can create immense overconfidence bias and elevated risk tolerance.

Gamification's impact on investors' risk perception and tolerance is complex and for some part contradictory as both Bazley et al. (2021) and Packin et al. (2025) acknowledge the ability of gamified elements in shaping the risk perception of investors and their decision-making processes that differ from the traditional, rational evaluation. Visual elements, rewards and ranking systems as well as the instant feedback these digital investment platforms provide the retail investor can quickly create the illusion of control and competence. Steering the retail investor into taking increased risks with the experience similar to entertainment and even gambling.

On the other hand, Bazley et al. (2021) point out that some elements can also elevate risk aversion. This suggests that the effects of gamification are not one dimensional, depending on the nature of the incentive as well as the emotional interpretation of the investor. What both studies do tend to interpret is that investors are irrational, and they do not necessarily make decisions based off fundamentals. These findings question the traditional financial theories as well as the conception of the retail investor being rational operator that analyzes the information about the markets objectively. Next, the following section will delve into just how gamification rifles against this rationality and

traditional financial theories, for example from the Efficient Market Hypothesis (EMH) standpoint.

3.3 Gamification challenging traditional finance?

The effects of gamification reflect not only on individual investors but also on the financial theories as well as the broader markets. Traditional financial theories such as the EMH presumes that the individual investor is a rational being and that the market prices reflect all the information that is available. Behavioral finance on the other hand has shown things such as heuristics, emotions and cognitive biases dictate the decision-making process of investors which in turn can promote irrationality. Gamification and game elements implemented in financial applications and investment platforms, for example rewards, competitive leaderboards and instant feedback features have been shown to enhance irrationality and steer investors to decision-making that is based more on emotions and impulsivity. Next, this thesis will examine the connection between gamification, rationality, irrationality and market efficiency.

3.3.1 Rational markets, irrational investors

Traditional finance theory presumes that markets work in rational ways, and market prices are reflecting all the information available, effectively. In the Efficient Market Hypothesis, Fama (1970) presented that market prices should fluctuate only when new information is revealed, and individual errors correct themselves. Behavioral finance later disproved this matter by stating that retail investors are irrational beings and are affected by emotional influence and cognitive biases (Kahneman & Tversky, 1979).

Studies have confirmed this irrationality and for example the overconfidence bias gamification can cause. Leading to more active trading and subsequently diminishing profits with market fluctuations with no apparent information-based proof. In a study by

Shefrin and Statman (1985) described the so called “disposition effect” where they described how investors tend to sell their profitable investments too early and hold on to their unprofitable investments for too long. This goes against the traditional finance theory’s principle of rationality. This suggests that irrationality is a crucial part of market dynamics and phenomena such as gamification can further enhance these types of behaviors.

3.3.2 Gamified finance, market inefficiencies

Although behavioral finance can explain the growing irrationality’s effects on prices and trade, gamified finance brings new dimensions to development. Elements that gamification brings to the market and which fintech companies strive to implement on their platforms have been shown to affect investors but subsequently we will examine how gamification can lead to market inefficiency and challenge the presumptions of the traditional finance theories.

Gamified finance platforms as we have examined can have significant impact on market dynamics with their aim to push investors to emotion-based trade and steer investors’ decision-making processes away from the traditional fundamental analysis needed for rational decision-making. In a study by Hofacker et al. (2016) it was found that impulsive trade was increased exponentially when gamification was applied to investment platforms. Hamari et al. (2014) also noticed in their study that the incentives created by gamification on these platforms could lead to investors focusing more on the short-term gains rather than a long-term investment plan. Adding to this short-term view on the markets, investors that react strongly on visual cues and comparisons to others based their decision-making processes more on irrational reactions and not rational analysis. This was seen in the GameStop case of 2021, when this sort of irrationality of many investors created a bubble and boosted volatility in the market significantly (Stiebel, 2022).

Investors' irrational behavior as well as the effects that gamification has been discovered to have on the markets show that the presumptions of traditional finance theories on rationality and market efficiency are insufficient in today's world. Gamified investment platforms lower the decision-making threshold and increase investors' risk tolerance by making investing more entertainment-like rather than analytical. This said, it can be deduced that gamification enhances market inefficiencies in a way that traditional finance theories such as the EMH cannot explain.

3.4 Critical analysis and conclusion

The impact of gamification on investor behavior has been shown to be multidimensional and partly contradictory. Although gamification has been found to improve learning and commitment in certain environments, in the investing context the effects have been found to be mainly connected to the enhancing capabilities of irrationality. Studies show that gamified stimuli such as visual and reward based can decrease the rational analysis of investors and increase especially impulsivity and overconfidence bias (Hofacker et al., 2016; Packin et al., 2024). This development challenges the traditional finance theories' presumptions and encourages further research and theories where this kind of irrationality is considered. Behavioral finance brought up the conversation on investors' irrationality and gamification enhances that by making investing more like entertainment. By not only revealing existing biases in investors but having the ability to amplify those irrational tendencies and build on them.

Future research should deepen the understanding on how gamification and gamified elements such as progression graphs and social comparison affect investors' decision-making in different contexts and demographics. One aspect to be researched in the future would be if gamification's effects are long lasting, for example if gamification can create patterns of behavior that affect the investor's ability in creating wealth for oneself. Future research could also examine how regulators should consider the possible effects

of gamification on market volatility without suppressing the innovations of fintech companies.

Considering current research, gamification represents a kind of transition from traditional and rational investing to a more entertainment-like, impulsive and socially driven decision-making. The market dynamics cannot be explained by rationality anymore and this change highlights the need for new theoretical models which would take into account the special characteristics of a gamified environment and their effects on the markets.

4 Conclusions

The motivation behind this thesis comes from the increasing influence of gamification across various industries, including finance as well as the growing need to understand its effects on retail investor behavior. As digital investment platforms have made market access easier and cheaper for the masses, the implementation of gamified elements such as badges, leaderboards, and visual cues has changed the way individuals approach investing. This challenges traditional finance's assumptions of rationality in financial markets and calls for deeper analysis of behavioral dynamics in gamified environments.

The thesis aimed to address the three research questions: how gamification influences decision-making and risk-taking in general, how it specifically affects retail investors' behavior, and how it challenges traditional financial theories like the Efficient Market Hypothesis (EMH). Based on the literature, the findings heavily support the listed hypotheses.

Firstly, gamification was found to increase willingness of individuals to take risks by lowering psychological barriers and creating more engaging decision-making environments. Research in education and behavioral studies confirmed that gamified mechanisms such as progression tracking, rewards, and competition promote greater risk-taking and the birth of new habits even after the immediate exposure.

Secondly, when focusing on retail investors, the literature strongly supported the hypothesis that gamified elements amplify behavioral biases. Platforms using visual cues, instant feedback, and social comparison features were found to increase impulsivity, overconfidence, and sensitivity to biases such as anchoring, availability, and herding. Gamified systems encouraged frequent trading and riskier investment strategies, often without appropriate rational analysis.

Thirdly, the literature revealed that gamification challenges the presumptions of traditional finance theories. By promoting emotional and heuristic-driven decision-

making, gamification introduces systematic irrationality into the markets and reinforcing inefficiencies that the EMH cannot fully explain. Examples such as the GameStop short squeeze demonstrate how mass behavior, fueled by gamified digital communities, can create volatility and price distortions disconnected from rationality and fundamental values.

Limitations of gamification research are theoretical and literature-based approaches. While the analysis covers a wide range of academic studies and real-world examples, the lack of empirical testing or quantitative data limits the generalization of these findings. Furthermore, the dynamic nature of fintech platforms and ever-evolving gamification make it difficult to capture the full and long-term impact of gamification on investor behavior.

Future research could address these limitations by incorporating experimental or observational data to measure actual investor behavior on gamified platforms. Comparative studies across different demographic groups or cultural contexts would also be valuable in understanding how various types of investors respond to gamification. Furthermore, as gamified investing continues to blur the lines between entertainment and finance, future studies could explore regulatory implications and long-term effects on financial literacy and market stability.

Overall, the thesis concludes that gamification has a significant and multidimensional impact on retail investor behavior, enhancing irrational tendencies and challenging the foundations of traditional financial thinking. The results confirm the set hypotheses and emphasize the importance of continuing to explore the long-term effects of gamification on financial markets, especially due to evolving fintech innovations.

References

Autopilot Holdings Corporation. (n.d.). Autopilot – The investment app. Autopilot. Retrieved 17.3.2025 from https://www.joinautopilot.com/

Barber, B.M., Huang, X., Odean, T. and Schwarz, C. (2020). Attention Induced Trading and Returns: Evidence from Robinhood Users. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3715077

Bayuk, J. & Altobello, S. A. (2019). Can gamification improve financial behavior? The moderating role of app expertise. International Journal of Bank Marketing. https://doi.org/10.1108/IJBM-04-2018-0086

Bazley, W. J., Cronqvist, H., & Mormann, M. (2021). Visual finance: The pervasive effects of red on investor behavior. Management science, 67(9), 5616-5641. https://doi.org/10.1287/mnsc.2020.3747

Bhatnagar A. B., Prakash V., Memon S. A., Manjushri Kadam P. & Sharma M. (2022). Mobile Technology and Digital Platforms in Behavioural Finance. 2022 International Conference on Smart and Sustainable Technologies in Energy and Power Sectors (SSTEPS), Mahendragarh, India, 2022, pp. 155-158, https://doi.org/10.1109/SSTEPS57475.2022.00047

Bingqiao, L., Lian, B. G. S., Arisandi, D., Fei, P. G., & Moi, R. L. C. Understanding the Decision-Making Dynamics of Retail Investors in The Fintech Era–A SEM Approach. https://doi.org/10.47509/AJEF.2024.v06i04.01

Bitrián, P., Buil, I. & Catalán, S. (2021). Making finance fun: the gamification of personal financial management apps. International Journal of Bank Marketing. https://doi.org/10.1108/IJBM-02-2021-0074

Cardador, M. T., Northcraft, G. B., & Whicker, J. (2017). A theory of work gamification: Something old, something new, something borrowed, something cool? Human Resource Management Review, 27(2), 353–365. https://doi.org/10.1016/j.hrmr.2016.09.014

Deterding, S., Dixon, D., Khaled, R. & Nacke, L. (2011). From game design elements to gamefulness: defining "gamification". MindTrek '11: Proceedings of the 15th

International Academic MindTrek Conference: Envisioning Future Media Environments. https://doi.org/10.1145/2181037.2181040

Einhorn N, Fisch J. E., Gramitto Ricci S. A., Le M. & Sautter C. M. (2023). The Retail Investor Report. Public.com. Retrieved 17.3.2025 from https://irlaw.umkc.edu/faculty_works/928

Elverdam C., & Aarseth E. (2007). Game Classification and Game Design: Construction Through Critical Analysis. Sage Journals. https://doi.org/10.1177/1555412006286892

Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. The Journal of Finance, 25(2), 383–417. https://doi.org/10.2307/2325486

Fernando, P. A., & Premadasa, H. K. S. (2024). Use of gamification and game-based learning in educating Generation Alpha: A systematic literature review. Educational Technology & Society, 27(2), 114-132. https://doi.org/10.30191/ETS.202404_27(2).RP03

Hamari, J. & Huotari, K. (2017). A Definition for Gamification: Anchoring Gamification in the Service Marketing Literature. Electronic Markets. https://doi.org/10.1007/s12525-015-0212-z

Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does Gamification Work? – A Literature Review of Empirical Studies on Gamification. In Proceedings of the 47th Hawaii International Conference on System Sciences (pp. 3025–3034). https://doi.org/10.1109/HICSS.2014.377

Hofacker, C. F., de Ruyter, K., Lurie, N. H., Manchanda, P., & Donaldson, J. (2016). Gamification and mobile marketing effectiveness. Journal of Interactive Marketing, 34, 25–36. https://doi.org/10.1016/j.intmar.2016.03.001

Khan, J., Zhang, Q., Zada, M., Saeed, I., & Khattak, S. A. (2024). Gamification in hospitality: Enhancing workplace thriving and employee well-being. Acta Psychologica, 240, 104243. https://doi.org/10.1016/j.actpsy.2024.104243

Kahneman, D., & Tversky, A. (1981). The framing of decisions and the psychology of choice. Science, 211(4481), 453–458. https://doi.org/10.1126/science.7455683

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. Econometrica, 47(2), 263–291. https://doi.org/10.2307/1914185

Kahneman, D., & Tversky, A. (1974). Judgment under uncertainty: Heuristics and biases. Science, 185(4157), 1124–1131. https://doi.org/10.1126/science.185.4157.1124

Lieberoth, A. (2015). Shallow gamification: Testing psychological effects of framing an activity as a game. Games and Culture, 10(3), 229-248. https://doi.org/10.1177/1555412014559978

Markowitz, H. (1952). Portfolio selection. The Journal of Finance, 7(1), 77–91. https://doi.org/10.2307/2975974

Minton, B. A. & Schrand C. (2016). Institutional investments in pure play stocks and implications for hedging decisions. Journal of Corporate Finance, 37, 132–151. https://doi.org/10.1016/j.jcorpfin.2015.12.013

Moore, M. & Ljungkvist, H. (2022). Gamification and its effect on investor behaviour: A qualitative study investigating the gamified trading platform Avanza. Umeå University. https://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-197275

Nickerson, R. S. (1998). Confirmation bias: A ubiquitous phenomenon in many guises. Review of General Psychology, 2(2), 175–220. https://doi.org/10.1037/1089-2680.2.2.175

Nordnet. (2025). Nordnetin hinnasto. Retrieved 22.4.2025 from https://www.nordnet.fi/fi/palvelut/hinnasto

OSC. (2022). Digital Engagement Practices in Retail Investing: Gamification and Other Behavioural Techniques. Retrieved 22.4.2025 from https://www.osc.ca/sites/default/files/2022-11/sn_20221117_11-796_gamification-report.pdf

Packin, N. G., Kliger, D., Reichman, A., & Rabinovitz, S. (2024). Hooked and hustled: The predatory allure of gamblified finance. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.5090194

Piotrowski, M., & Bünnings, C. (2024). How heuristics in judgment influence the securities investment decision process. Journal of Financial Services Marketing, 29(97–105). https://doi.org/10.1057/s41264-022-00184-7

Rai, R. D., & Murthy, S. A Systematic Review of Theoretical Perspectives and Technology-Based Strategies for Fostering Critical Thinking Skills in the Age of Misinformation. https://doi.org/10.5281/zenodo.14003706

Robson, K., Plangger, K., Kietzmann, J., McCarthy, I., Pitt, L. (2015). Is it all a game? Understanding the principles of gamification. Business Horizons. https://doi:10.1016/j.bushor.2015.03.006

Shatz, I. (2015). Using gamification and gaming in order to promote risk taking in the language learning process. In Proceedings of the 13th Annual MEITAL National Conference. Haifa, Israel: Technion (pp. 227-32). Retrieved 17.4.2025 from https://www.researchgate.net/publication/281969734_Using_Gamification_and_Gaming_in_Order_to_Promote_Risk_Taking_in_the_Language_Learning_Process

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. https://doi.org/10.1111/j.1540-6261.1985.tb05002.x

Sombrio, G. D. S., Ulbricht, V. R., & Haeming, W. K. (2014). Games and Gamification: A Proposal for a Creative Learning Process in Education. Journal of Education and Human Development, 3(4), 117–129. https://doi.org/10.15640/jehd.v3n4a12

Stiebel, J. (2022). Power to the players: The GameStop short squeeze and the rise of retail investors. Journal of Financial Markets, 45(2), 112-135. https://doi.org/10.2139/ssrn.3883295

Zhao, F., Guo, D. (2019). Rewards in Gamification. In: Fang, X. (eds) HCI in Games. HCII 2019. Lecture Notes in Computer Science, vol 11595. Springer, Cham. https://doi.org/10.1007/978-3-030-22602-2_34