Why Do Borrowers Become Over-Indebted? The Roles of Financial Literacy, Risk Perception, and Behavioral Bias in Peer-to-Peer Lending

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ABSTRACT

The increasing use of online lending has raised concerns about over-indebtedness among users. This study aims to examine the effects of financial literacy, risk perception, and behavioral bias on over-indebtedness, with financial self-control as a moderating variable. This research employs a quantitative approach using primary data collected through questionnaires from 208 online lending users in Indonesia with diverse demographic characteristics, predominantly within the productive age group, with secondary to higher education levels, and moderate income. Data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS). The results indicate that financial literacy, risk perception, and behavioral bias significantly affect over-indebtedness, with behavioral bias emerging as the most dominant factor. Financial self-control moderates several relationships, although its effects are not consistent across all variables. These findings suggest that over-indebtedness in digital lending is not solely driven by rational considerations, but is strongly influenced by behavioral and psychological factors. Theoretically, this study extends the Theory of Planned Behavior by integrating behavioral bias and financial self-control in explaining digital debt behavior. Practically, the findings highlight the importance of incorporating behavioral-based financial education, strengthening consumer protection policies, and promoting responsible fintech design to mitigate excessive debt risk.

ABSTRACT

Meningkatnya penggunaan pinjaman daring telah menimbulkan kekhawatiran tentang utang berlebih di kalangan penggunanya. Penelitian ini bertujuan untuk mengkaji pengaruh literasi keuangan, persepsi risiko, dan bias perilaku terhadap utang berlebih, dengan pengendalian diri keuangan sebagai variabel moderasi. Penelitian ini menggunakan pendekatan kuantitatif dengan data primer yang dikumpulkan melalui kuesioner dari 208 pengguna pinjaman daring di Indonesia yang memiliki karakteristik demografis beragam, sebagian besar berada pada kelompok usia produktif, berpendidikan menengah hingga tinggi, dan berpenghasilan sedang. Data dianalisis menggunakan Structural Equation Modeling–Partial Least Squares (SEM-PLS). Hasil penelitian menunjukkan bahwa literasi keuangan, persepsi risiko, dan bias perilaku berpengaruh signifikan terhadap utang berlebih, dengan bias perilaku sebagai faktor yang paling dominan. Pengendalian diri keuangan memoderasi beberapa hubungan, meskipun pengaruhnya tidak konsisten di semua variabel. Temuan ini mengindikasikan bahwa utang berlebih dalam pinjaman digital tidak hanya didorong oleh pertimbangan rasional, tetapi juga sangat dipengaruhi oleh faktor perilaku dan psikologis. Secara teoretis, penelitian ini memperluas Theory of Planned Behavior dengan mengintegrasikan bias perilaku dan pengendalian diri keuangan dalam menjelaskan perilaku utang digital. Secara praktis, temuan ini menyoroti pentingnya memasukkan pendidikan keuangan berbasis perilaku, memperkuat kebijakan perlindungan konsumen, dan mendorong desain fintech yang bertanggung jawab untuk memitigasi risiko utang berlebih.

1. INTRODUCTION

The development of financial technology in Indonesia over the past decade has significantly transformed the way individuals manage their finances, particularly through the emergence of online lending services (peer-to-peer lending). Easy access, rapid approval processes, and minimal administrative requirements have made online loans an increasingly popular financing alternative, especially among the productive-age population and individuals with limited access to formal financial institutions (Erdi, 2023). Data from the Financial Services Authority (OJK) indicate that the total volume of online loan disbursements continues to grow annually, accompanied by a rising number of active borrower accounts. However, this growth has also been followed by an increased risk of loan defaults, non-performing loans, and over-indebtedness, which can adversely affect the financial stability of individuals and households (Blázquez et al., 2020; Dawolo et al., 2025; Dayanti et al., 2024; Erdi, 2023; Leandro & Botelho, 2022; Mawarni, 2024). This phenomenon suggests that the decision to use online loans is not solely based on rational considerations but is also influenced by psychological factors and individuals' financial behavior.

Previous studies have examined the factors influencing individuals' decisions to use online loans. Erdi (2023) demonstrated that financial literacy, lifestyle, and consumptive behavior significantly affect online borrowing decisions, with financial inclusion serving as a moderating variable. Consistent with this, several studies indicate that low financial literacy increases the likelihood of using online loans due to limited awareness of the associated risks and long-term consequences of digital debt (Asriyani & Johan, 2023; Gayatri & Muzdalifah, 2022; Gonzalez, 2023; Oh & Rosenkranz, 2022). Nevertheless, other empirical evidence reveals that individuals with relatively high financial literacy continue to rely on online loans, driven by ease of access, low risk perception, and short-term financial pressures (Angelista et al., 2024; Grediani et al., 2023; Kurniawati et al., 2025; Sukasih et al., 2025). These divergent findings indicate that financial literacy alone is insufficient to fully explain digital borrowing behavior.

In addition to inconsistencies in empirical findings, prior studies also suffer from significant methodological limitations. Most existing research continues to focus on intention or the decision to use online lending services, without examining the actual financial consequences, particularly the level of over-indebtedness as an outcome variable. From a behavioral accounting perspective, repetitive and uncontrolled financial behavior is ultimately reflected in an individual's financial condition, especially in the inability to manage cash flows and debt obligations. Moreover, many studies have not sufficiently integrated deeper psychological variables such as behavioral bias and financial self-control, which theoretically play a crucial role in financial decision-making. Consequently, the understanding of the mechanisms through which individuals fall into excessive debt due to online loans remains relatively limited.

Prior studies show that behavioral biases and weak self-control are key drivers of over-indebtedness (Bactiar et al., 2025; Nisa et al., 2025; Siregar et al., 2022). Individuals with high impulsivity and low self-control are more prone to financial distress, even when they possess adequate financial literacy (Hidayati et al., 2023; Naefs & Iramani, 2024; Rosadi & Andriani, 2023; Yawanah & Wibowo, 2025). However, existing studies predominantly focus on general debt behavior and largely overlook online lending as a unique form of digital debt characterized by instant access, high costs, and short repayment periods. More importantly, prior research tends to examine these factors in isolation and at the level of borrowing intention, rather than explaining actual financial outcomes such as over-indebtedness. This creates a critical gap in the literature, namely, the absence of an integrated model that simultaneously incorporates financial literacy, risk perception, behavioral bias, and self-control in explaining over-indebtedness in the context of online lending. The urgency of this study lies in the rapid growth of online lending, which not only affects individual financial stability but also poses broader socioeconomic risks, including financial stress, declining household welfare, and reduced productivity. From a behavioral accounting perspective, understanding the interplay between cognitive, psychological, and control factors is essential for developing effective financial management strategies and regulatory policies. Therefore, this study seeks to provide a more comprehensive explanation of digital debt behavior by focusing on its actual financial consequences.

Theoretically, this study is grounded in the Theory of Planned Behavior (TPB), which explains that individual behavior is influenced by attitudes, perceived behavioral control, and other internal factors (Ajzen, 2020). In the context of online lending, financial literacy and risk perception represent attitudes and rational evaluations of debt, while behavioral bias reflects deviations from rational behavior arising from cognitive and emotional factors. Financial self-control is a control mechanism that determines the extent to which individuals can restrain impulsive urges when making debt-related decisions. By integrating this theoretical framework, this study aims to provide a more comprehensive understanding of the dynamics of digital debt behavior.

2. THEORETICAL FRAMEWORK AND HYPOTHESES

2.1. Financial Literacy and Over-Indebtedness

Financial literacy is defined as an individual's ability to understand financial concepts, manage personal finances, and make appropriate financial decisions (Erdi, 2023). From the Theory of Planned Behavior (TPB) perspective, financial literacy represents an individual's attitude and cognitive control over financial decision-making. Numerous studies indicate that low financial literacy is associated with increased risky debt behavior and difficulties in managing financial obligations. Arrezqi (2024); Asriyani & Johan (2023); Gayatri & Muzdalifah (2022); Pratiwi et al. (2025) find that individuals with low financial literacy are more likely to become trapped in consumptive debt, including online loans. Furthermore, Oh & Rosenkranz (2022) demonstrate that a limited understanding of interest costs and digital credit risks increases the likelihood of financial problems. However, other empirical findings reveal inconsistent results. Several studies show that individuals with relatively high financial literacy continue to use online loans due to ease of access and short-term liquidity needs (Erdi, 2023; Jannata & Suhartini, 2023; Livia et al., 2025). Mulyawan et al. (2025) and Maivalinda et al. (2023) also indicate that financial literacy does not always function as a protective factor against digital credit usage. These divergent findings suggest that while financial literacy remains an important factor, its influence on individual debt conditions needs to be further examined at the level of financial consequences, particularly over-indebtedness. Based on this argument, the following hypothesis is formulated.

H1: Financial literacy significantly affects the level of over-indebtedness among online loan users.

2.2. Risk Perception and Over-Indebtedness

Risk perception refers to the extent to which individuals assess and understand the risks inherent in a financial decision (Siegrist & Árvai, 2020). Within the Theory of Planned Behavior (TPB) framework, risk perception is related to the subjective evaluation of the consequences of a behavior. Individuals who perceive the risks of online loans as low tend to make borrowing decisions more easily without adequately considering their long-term impacts (Jannata & Suhartini, 2023). Studies by Susilowati & Lutfi (2024) and Leandro & Botelho (2022) indicate that a low level of risk perception toward digital credit increases the probability of repetitive borrowing behavior. Several other studies also find that low risk perception encourages excessive use of online loans and heightens the likelihood of default (Addella & Sijabat, 2021; Asri et al., 2022; Saputra & Sulindawati, 2024). Conversely, individuals with high risk perception tend to be more cautious and selective in using online loans, thereby reducing the risk of over-indebtedness (Prajogo & Rusno, 2022). Therefore, the lower an individual's risk perception, the higher the likelihood of experiencing over-indebtedness.

H2: Risk perception significantly affects the level of over-indebtedness among online loan users.

2.3. Behavioral Bias and Over-Indebtedness

Behavioral bias reflects deviations in individual behavior from the assumptions of economic rationality due to cognitive and emotional factors, such as overconfidence, impulsivity, and present bias. Behavioral biases cause individuals to disregard relevant financial information and underestimate risks. Studies by Abdullah et al. (2022); Bactiar et al. (2025); Siregar et al. (2022) demonstrate that behavioral bias has a significant effect on consumptive debt behavior and financial distress. Other studies also find that individuals who are impulsive and overconfident are more vulnerable to over-indebtedness, even when they possess an adequate level of financial literacy (Candika et al., 2025; Erdi, 2023). In the context of online lending, the fast and instant nature of these services amplifies the effects of behavioral bias, making individuals more likely to make borrowing decisions without careful financial planning. Therefore, the stronger the behavioral bias an individual exhibits, the greater the likelihood of experiencing over-indebtedness. Based on these arguments, the following hypothesis is proposed.

H3: Behavioral bias significantly affects the level of over-indebtedness among online.

2.4. The Moderating Role of Financial Self-Control on Over-Indebtedness

Financial self-control refers to an individual's ability to regulate consumption impulses, delay short-term gratification, and consistently implement financial decisions in accordance with long-term goals (Peetz & Davydenko, 2021). From the perspective of the Theory of Planned Behavior, financial self-control represents perceived behavioral control, which determines whether financial knowledge, risk perception, and behavioral tendencies are effectively translated into actual behavior. In the relationship between financial literacy and over-indebtedness, financial literacy provides an understanding of debt risks and borrowing capacity; however, its effectiveness largely depends on an individual's ability to apply this knowledge in practice (Erdi, 2023; Khoirunnisa & Purnamasari, 2024). Individuals with high financial literacy but low self-control are prone to impulsive borrowing decisions. Therefore, financial self-control strengthens the negative effect of financial literacy on overindebtedness. Regarding the relationship between risk perception and over-indebtedness, awareness of the risks associated with online loans does not necessarily lead to debt-avoidance behavior if individuals cannot control short-term impulses (Asri et al., 2022; Susilowati & Lutfi, 2024). High financial self-control enables individuals to translate risk perceptions into concrete actions, thereby reinforcing the negative effect of risk perception on overindebtedness. Meanwhile, in the relationship between behavioral bias and over-indebtedness, behavioral biases encourage irrational borrowing decisions and increase the likelihood of excessive debt accumulation. Financial self-control functions as a buffering mechanism that restrains impulsive tendencies and mitigates the adverse effects of behavioral biases (Siregar et al., 2022). Thus, financial self-control weakens the behavioral bias's positive effect on over-indebtedness.

H4a: Financial self-control strengthens the effect of financial literacy on the level of over-indebtedness in online loan users.
H4b: Financial self-control strengthens the effect of risk perception on the level of over-indebtedness in online loan users.
H4c: Financial self-control weakens the effect of behavioral bias on the level of over-indebtedness among online loan users

3. RESEARCH METHOD

The conceptual framework of this study explains that over-indebtedness among online lending users is the outcome of financial decision-making processes influenced by individuals' cognitive and behavioral factors from a behavioral accounting perspective. This study integrates financial literacy, risk perception, and behavioral bias as the main determinants that directly affect over-indebtedness. Financial literacy reflects individuals' ability to understand and manage financial information, which is expected to reduce the risk of excessive debt (Erdi, 2023). Risk perception describes the extent to which individuals recognize and evaluate the risks associated with online loans, thereby shaping their prudence in borrowing decisions (Siegrist & Árvai, 2020). In contrast, behavioral biases such as impulsivity and overconfidence encourage irrational financial decisions and increase the tendency toward over-indebtedness (Siregar et al., 2022). Financial self-control is positioned as a moderating variable because it functions as an internal control mechanism that determines whether financial knowledge, risk perception, and behavioral tendencies are effectively translated into actual financial behaviors (Peetz & Davydenko, 2021). High financial self-control strengthens the protective role of financial literacy and risk perception in reducing over-indebtedness while simultaneously weakening the negative influence of behavioral bias (Leandro & Botelho, 2022).

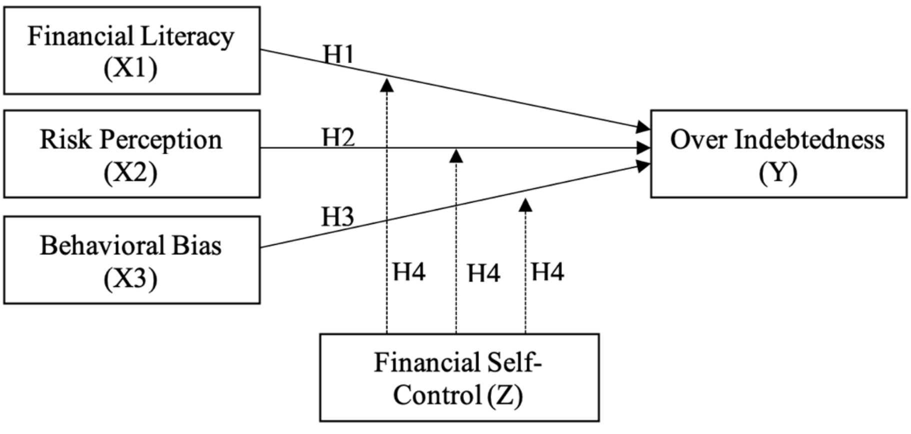

Figure 1. Conceptual framework

This study employed a quantitative approach with a causal research design to examine the effects of financial literacy, risk perception, and behavioral bias on the level of over-indebtedness among online loan users, as well as the moderating role of financial self-control. The research population consisted of individuals in Indonesia who had used online lending services. The sampling technique applied was purposive sampling, with respondent criteria including individuals who had used online loans at least once, were at least 17 years old, and had a source of income. The sample size was determined based on the requirements of the Structural Equation Modeling–Partial Least Squares (SEM-PLS) analysis.

The sample used in this study consisted of individuals who had experience using online lending services, either through a single or multiple platforms. Based on the questionnaire distribution, 208 respondents who utilized online lending services were included in the analysis. The respondents reported using various platforms, including Shopee Pinjaman, Kredivo, Adapundi, Indodana Finance, Akulaku, Rupiah Cepat, and AdaKami, reflecting the diversity of digital lending applications in the country.

This study employs primary data collected through structured questionnaires that were distributed online. All variables were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The measurement instruments were adapted from previously validated studies to ensure content validity and construct their reliability. The use of established instruments also enhances the consistency and comparability of the findings with prior research in behavioral finance and digital lending.

Table 1. Question Indicator

Variabel	Indicators	Item	Source
Financial Literacy (X1)	Understanding of basic financial concepts	I understand how interest works in online loan applications.	(Erdi, 2023; Oh & Rosenkranz, 2022)
	Understanding of interest and loan costs	I know the total cost that must be paid before taking an online loan.	
	Debt management capability	I can calculate my ability to repay a loan.	
	Financial planning	I have financial planning before deciding to borrow money.	
		I understand the financial risks associated with online loans.	
Risk Perception (X2)	Perceived risk of high interest rates	I am aware that online loans have high-interest rates.	(Siegrist & Árvai, 2020)
	Perceived risk of penalties	I believe that using online loans poses financial risk.	
	Perceived risk of default	I understand that there are penalties for late repayments.	
	Perceived long-term financial risks	I am aware of the risk of future repayment difficulties.	
		I consider the long-term consequences of taking an online loan.	
Behavioral Bias (X3)	Impulsivity	I often take online loans without careful planning.	(Candika et al., 2025; Siregar et al., 2022)
	Overconfidence	I feel confident that I can repay loans, even when my financial condition is unstable.	
	Present bias (short-term orientation)	I prioritize current needs over future risk.	
	Emotion-driven decision making	I take loans because of sudden urges or immediate desires.	
		I tend to ignore risk-related information when I need quick money.	
Financial Self-Control (Z)	Control over consumption impulses	I can restrain myself from taking loans unless they are necessary.	(Peetz & Davydenko, 2021)
	Ability to delay gratification	I carefully consider decisions before using online loans.	
	Financial discipline	I am disciplined in managing my expenses and my debts.	
	Consistency in financial decisions	I can delay my consumptive desires despite the ease of online loans.	
		I consistently follow my financial plan.	
Over-Indebtedness (Y)	Repayment difficulties	I have difficulty repaying my online loans.	(Leandro & Botelho, 2022)
	Repeated borrowing behavior	I often take out new loans to repay existing ones.	

Financial pressure	I feel financially burdened because of online loans.
Debt dependency	Most of my income is used to repay my debts.
	I feel dependent on online loans to meet my needs.

Data analysis was conducted using SEM-PLS with the assistance of SmartPLS software. The analysis stages include testing the measurement model (outer model) and the structural model (inner model). The outer model evaluation involves tests of convergent validity, discriminant validity, and construct reliability. Subsequently, the inner model is assessed through evaluations of multicollinearity, coefficient of determination, predictive relevance, and the significance of path coefficients and moderating effects using the bootstrapping procedure. Hypothesis testing is conducted by examining t-statistic and p-value values, where a hypothesis is accepted if the p-value is less than 0.05.

4. DATA ANALYSIS AND DISCUSSION

4.1. DATA ANALYSIS

This study involved 208 respondents who had experience using online lending services. Based on gender, the sample is slightly dominated by females (53%), while males account for 47%. In terms of age, the majority of respondents are 24–30 years old (52%), followed by those aged 17–24 years (30%) and above 40 years (18%), indicating that online lending is primarily used by young adults. Regarding education level, most respondents hold a bachelor's degree (41%), followed by diploma (30%) and senior high school (19%), suggesting a relatively moderate to high educational background. In terms of income source, the majority rely on employment (54%), followed by business (32%), indicating relatively stable income sources. Furthermore, most respondents (54%) earn between IDR 2.5 million and IDR 5 million per month, followed by those earning above IDR 5 million (33%) and below IDR 2.5 million (13%), reflecting a predominantly middle-income group. In terms of platform usage, Shopee Pinjaman (39%) and Kredivo (27%) are the most frequently used platforms, followed by Akulaku (13%) and AdaKami (11%). Importantly, the total frequency of platform usage (247) exceeds the number of respondents (208), indicating that many respondents use more than one online lending platform. This suggests a pattern of multiple borrowing behavior, which may increase the risk of over-indebtedness due to overlapping financial obligations.

Table 2. Respondent Charateristics

Description	Frequency	Percentage
Gender:		
Male	97	47%
Female	111	53%
Total	208	
Age:		
17 - 24 Years	62	30%
24 - 30 Years	109	52%
Above 40 Years	37	18%
Total	208	
Education Level:		
SMA/SMK	39	19%
Diploma	62	30%
Bachelor D4/S1	86	41%
Master S2	14	7%
Others	7	3%
Total	208	
Source of Income:		
Invesment	3	1%
Employment	112	54%
Business	67	32%
Others	26	13%
Total	208	
Monthly Income:		

Bellow IDR 2,5 Million	27	13%
IDR 2,5 Million - IDR 5 Million	113	54%
Above IDR 5 Million	68	33%
Total	208	
Online Lending Platforms Used		
Shopee Pinjaman	97	39%
Kredivo	66	27%
Adapundi	7	3%
Indodana	13	5%
Akulaku	31	13%
Rupiah Cepat	7	3%
Adakami	26	11%
Total	247	

The descriptive statistics show that most variables are in the high category (mean > 3.67), including financial literacy (3.95), risk perception (4.04), behavioral bias (3.94), and over-indebtedness (4.11). This indicates that the respondents had a good financial understanding and were aware of online lending risks. However, the high level of over-indebtedness suggests that cognitive factors alone are insufficient to prevent excessive borrowings. Financial self-control had a lower mean (3.56, moderate), indicating weaker behavioral regulation. This imbalance explains the persistence of over-indebtedness despite adequate knowledge and awareness of risk.

Table 3. Descriptive Statistics of Research Variables

Variable	Items	Mean	Std. Dev	Min	Max	Interpretation
Financial Literacy (X1)	5	3.95	0.93	1	5	High
Risk Perception (X2)	5	4.04	0.88	1	5	High
Behavioral Bias (X3)	5	3.94	0.94	1	5	High
Over-Indebtedness (Y)	5	4.11	1.01	1	5	High
Financial Self-Control (Z)	5	3.56	1.07	1	5	Moderate

The results of the convergent validity test indicate that all the constructs in this study meet the required criteria. The outer loading values for the financial literacy variable range from 0.78 to 0.85, with AVE values exceeding 0.50, indicating that the indicators strongly represent financial literacy. The risk perception variable shows outer loading values between 0.88 and 0.92 with AVE values above 0.50, demonstrating good convergent validity in measuring perceptions of online loan risk. For the behavioral bias variable, the outer loading values range from 0.82 to 0.92 with AVE values above 0.50, indicating that the indicators accurately capture behavioral bias tendencies.

Furthermore, the financial self-control variable exhibited outer loading values between 0.89 and 0.92 with AVE values above 0.50, confirming its validity as a moderating variable. Meanwhile, the over-indebtedness variable had outer loading values ranging from 0.84 to 0.93 with AVE values above 0.50, indicating that this construct was measured validly. Thus, it can be concluded that all the constructs in this study satisfied the criteria for convergent validity.

In addition, the reliability test results show that Cronbach's alpha and composite reliability values for all constructs exceed 0.70. These findings indicate that the research instrument has a high level of internal consistency and is reliable for measuring the study variables. Overall, the results of the validity and reliability tests demonstrate that the measurement model employed in this study meets methodological standards and is suitable for further analysis at the structural model stage.

Table 4. Convergen Validity Test

Construct	Indicator	*Loading Factor*	Average Variance Extracted	Cronbach Alpha	Composite Reliability
Financial Literacy (X1)	Financial1	0.834	0.665	0.874	0.908
	Financial2	0.858			
	Financial3	0.805			

	Financial4	0.790			
	Financial5	0.788			
Risk Perception (X2)	Risk1	0.924	0.813	0.943	0.956
	Risk2	0.888			
	Risk3	0.890			
	Risk4	0.911			
	Risk5	0.896			
Behavioral Bias (X3)	Behavioral1	0.827	0.801	0.937	0.952
	Behavioral2	0.907			
	Behavioral3	0.928			
	Behavioral4	0.910			
	Behavioral5	0.899			
Financial Self-Control (Z)	FSC1	0.898	0.832	0.949	0.961
	FSC2	0.926			
	FSC3	0.930			
	FSC4	0.902			
	FSC5	0.903			
Over Indebtedness (Y)	OI1	0.922	0.808	0.940	0.955
	OI2	0.846			
	OI3	0.934			
	OI4	0.938			
	OI5	0.850			

The results of the Fornell–Larcker criterion test, as presented in Table 2, indicate that all constructs satisfy discriminant validity assumptions. The square root of the AVE for each construct is higher than its correlations with the other constructs: behavioral bias (0.895), financial literacy (0.816), financial self-control (0.912), over-indebtedness (0.899), and risk perception (0.902). These results demonstrate that each construct accurately represents its corresponding variable and is distinct from the other constructs; therefore, the research model exhibits excellent discriminant validity.

Table 5. Convergen and Discriminant Validity Fornell-Larcker Criterion

Kriteria	Behavioral Bias	Financial Literacy	Financial Self-Control	Moderating Effect 1	Moderating Effect 2	Moderating Effect 3	Over-Indebtedness	Risk Perception
Behavioral Bias	**0.895**							
Financial Literacy	0.761	**0.816**						
Financial Self-Control	0.470	0.551	**0.912**					
Moderating Effect 1	-0.466	-0.450	-0.235	**1.000**				
Moderating Effect 2	-0.256	-0.224	-0.079	0.575	**1.000**			
Moderating Effect 3	-0.425	-0.421	-0.266	0.870	0.653	**1.000**		
Over-Indebtedness	0.805	0.736	0.477	-0.522	-0.303	-0.499	**0.899**	
Risk Perception	0.669	0.600	0.329	-0.237	-0.411	-0.246	0.663	**0.902**

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The VIF results indicate that all variables have values below the threshold of 5, ranging from 1.485 to 5.045. Behavioral bias (3.237), financial literacy (2.974), risk perception (2.603), and financial self-control (1.485) showed no multicollinearity issues. Although Moderating Effect 3 has a slightly higher VIF value (5.045), it remains within the acceptable tolerance range for SEM-PLS analysis. Overall, these results suggest that multicollinearity is not a concern in the structural model, and the model is suitable for further analyses.

Table 6. VIF Internal

Variable	Over-Indebtedness
Behavioral Bias	3,237
Financial Literacy	2,974
Financial Self-Control	1,485
Moderating Effect 1	4,503
Moderating Effect 2	2,389
Moderating Effect 3	5,045
Risk Perception	2,603

The R-square value for the over-indebtedness variable is 0.739, indicating that 73.9 percent of the variation in over-indebtedness can be explained by financial literacy, risk perception, behavioral bias, and their interactions with financial self-control. This value is considered high in social and behavioral research, suggesting that the research model has strong explanatory power. The high R-square value indicates that the combination of cognitive factors, risk perception, and behavioral biases, moderated by financial self-control, constitutes important determinants in explaining the phenomenon of over-indebtedness among online lending users. These findings reinforce the behavioral accounting perspective, which emphasizes that individuals' financial conditions are influenced not only by economic factors but also by psychological and behavioral aspects.

Table 7. R-Square

Variable	R Square	R Square Adjusted
Over-Indebtedness	0.739	0.731

The model fit results indicate that the SRMR value for both the saturated and estimated models was 0.049, which is below the recommended threshold of 0.08, suggesting a good model fit. The d_ULS and d_G values showed minimal differences between the saturated and estimated models, indicating model stability. Additionally, the NFI values (0.886 and 0.887) were close to 0.90, reflecting an acceptable level of model fit. Overall, these results confirm that the structural model demonstrates a satisfactory goodness-of-fit and is appropriate for further analyses.

Table 8. model fit index (SRMR)

	Saturated Model	Estimated Model
SRMR	0,049	0,049
d_ULS	0,788	0,790
d_G	0,521	0,537
Chi-Square	653,848	648,783
NFI	0,886	0,887

The f^2 results indicate that behavioral bias has a moderate effect on over-indebtedness (0.169), making it the strongest predictor in this model. Risk perception had a small effect (0.119), whereas financial literacy (0.027) and financial self-control (0.010) had weak effects. Similarly, all moderating effects demonstrated small effect sizes (ranging from 0.016 to 0.026). Overall, these findings suggest that behavioral factors, particularly behavioral bias, play a more dominant role in explaining over-indebtedness than cognitive and control factors.

Table 9. Effect Size

	Over-Indebtedness
Behavioral Bias	0,169
Financial Literacy	0,027
Financial Self-Control	0,010
Moderating Effect 1	0,016
Moderating Effect 2	0,026
Moderating Effect 3	0,018
Risk Perception	0,119

Table 10. Hypothesis Test

Construct	Original Sample	Sample Mean	Standard Deviation	T-Statistic	P-Values	Information
Financial Literacy → Over Indebtedness	0.145	0.155	0.072	2.008	0.045	Accepted
Risk Perception → Over Indebtedness	0.284	0.278	0.076	3.741	0.000	Accepted
Behavioral Bias → Over Indebtedness	0.378	0.370	0.073	5.177	0.000	Accepted
Financial Literacy x Financial Self-Control → Over Indebtedness	-0.103	-0.094	0.047	2.194	0.029	Accepted
Risk Perception x Financial Self-Control → Over Indebtedness	0.090	0.080	0.044	2.043	0.042	Accepted
Behavioral Bias x Financial Self-Control → Over Indebtedness	-0.103	-0.103	0.053	1.960	0.051	Rejected

Significance testing was conducted using the criteria of a t-statistic value greater than 1.96 and a p-value less than 0.05 at the 5% significance level. The hypothesis testing results indicate that financial literacy has a positive and significant effect on over-indebtedness among online loan users, with a path coefficient of β = 0.145, a t-statistic of 2.008, and a p-value of 0.045. The t-statistic exceeding the critical value of 1.96 and the p-value below 0.05 indicate that hypothesis H1 is accepted.

The hypothesis testing results also show that risk perception has a positive and significant effect on over-indebtedness in online loan users. This is evidenced by a path coefficient of β = 0.284, t-statistic of 3.741, and p-value of 0.000. The t-statistic far exceeded the critical value of 1.96, and the p-value was below 0.05, indicating that hypothesis H2 is accepted.

Furthermore, the results indicate that behavioral bias has a positive and significant effect on over-indebtedness among online loan users. This is reflected by a path coefficient of β = 0.378, a t-statistic of 5.177, and a p-value of 0.000. The t-statistic substantially exceeds the critical value of 1.96, and the p-value is below 0.05, confirming that hypothesis H3 is accepted.

The hypothesis testing results demonstrate that financial self-control significantly moderates the relationship between financial literacy and overindebtedness. This is shown by an interaction coefficient of β = –0.103, a t-statistic of 2.194, and a p-value of 0.029. The t-statistic exceeds the critical value of 1.96 and the p-value is below 0.05, indicating that hypothesis H4a is statistically supported.

Additionally, the results reveal that financial self-control significantly moderates the relationship between risk perception and being over-indebted. This is indicated by an interaction coefficient of β = 0.090, t-statistic of 2.043, and p-value of 0.042. A t-statistic greater than 1.96 and a p-value below 0.05 suggest that hypothesis H4b is accepted.

However, the results show that financial self-control does not significantly moderate the relationship between behavioral biases and over-indebtedness. This is evidenced by an interaction coefficient of β = –0.103, t-statistic of 1.960, and p-value of 0.051. Although the t-statistic is close to the critical value of 1.96, the slightly higher p-value than 0.05 indicates that H4c is rejected.

4.2. Discussion

The results show that financial literacy has a positive and significant effect on over-indebtedness among online lending users. This finding indicates that higher financial knowledge does not automatically reduce the risk of excessive debt, particularly in the context of digital lending. Theoretically, this result can be explained through the behavioral finance perspective, which suggests that higher financial knowledge may trigger overconfidence, namely an excessive belief in one's ability to manage debt obligations effectively. Within Ajzen (2020) Theory of Planned Behavior (TPB) framework, financial literacy represents the cognitive component; however, it does not guarantee the realization of rational financial behavior in the absence of actual behavioral control. This finding is consistent with studies by Angelista et al. (2024); Erdi (2023); Kurniawati et al. (2025), which report that individuals with relatively good financial literacy continue to use online loans due to ease of access and short-term liquidity needs. Conversely, this result contradicts the findings of Gayatri & Muzdalifah (2022) and Asriyani & Johan (2023), who conclude that financial literacy functions as a protective factor against debt-related behavior. This discrepancy reinforces the argument that financial literacy should be examined at the level of actual financial consequences, rather than merely at the level of intention or interest in using online loans.

The results indicate that risk perception has a positive and significant effect on over-indebtedness. This finding suggests that individuals' awareness of online loan risks, such as high interest rates, penalties, and the potential for default, does not necessarily function as a deterrent to borrowing behavior. Under conditions of financial pressure, individuals remain willing to take risks that they are fully aware of. This phenomenon can be explained by prospect theory, which posits that individuals tend to exhibit risk-seeking behavior when facing losses or financial constraints. These results are consistent with the findings of Leandro & Botelho (2022); Susilowati & Lutfi (2024), who show that high risk perception does not always reduce borrowing tendencies, particularly in digital-based consumer credit. However, this study's findings contradict those of Prajogo & Rusno (2022), who found that higher risk perception suppresses interest in using online loans. This discrepancy indicates that among younger age groups, risk perception is often outweighed by short-term needs and the belief that risks can be managed in the future.

The findings reveal that behavioral bias exerts a positive and predominant influence on over-indebtedness. This emphasizes that psychological factors such as impulsivity, present bias, and overconfidence are significant determinants in elucidating the phenomenon of excessive debt. From a behavioral accounting perspective, such biases lead individuals to deviate from the assumption of economic rationality, resulting in debt-related decisions that are primarily driven by emotions and short-term impulses rather than long-term cash flow considerations. These findings align with the research conducted by □, which demonstrates that behavioral biases elevate the propensity for consumptive debt and financial distress. In the context of online lending, the rapid and instantaneous nature of these services further accentuates the influence of behavioral biases, rendering individuals more susceptible to over-indebtedness, even when they possess an adequate level of financial literacy.

The majority of respondents in this study were young people aged 24–30 with a bachelor's degree and an average income of Rp2,500,000–Rp5,000,000. These characteristics reflect a group of young adults who, cognitively, possess adequate analytical abilities but remain in the early phase of economic stability. At this stage, individuals tend to face income constraints, increasing consumption needs, and lifestyle pressures, which cause financial decision-making to be influenced not only by knowledge but also by self-control and psychological factors. From the perspective of TPB Ajzen (2020), this condition indicates a gap between attitude and behavior, whereby individuals may have sufficient understanding and positive attitudes toward financial management but are not always able to translate them into controlled financial behaviors without strong perceived behavioral control, which in this study is represented by financial self-control.

The results indicate that financial self-control significantly weakens the effect of financial literacy on over-indebtedness. This finding suggests that among young respondents with an undergraduate level of education, relatively good financial literacy does not automatically reduce the risk of excessive debt. Individuals with adequate financial knowledge may instead exhibit high confidence in utilizing online lending products, particularly when faced with short-term financial needs and limited income. However, when individuals possess a high level of financial self-control, such knowledge is more effectively directed toward disciplined financial behavior, such as limiting borrowing amounts and carefully considering repayment capacity. These findings are consistent with those of Erdi (2023) and Angelista et al. (2024), who indicated that financial literacy without self-control may increase the risk of poor financial decision-making. Thus, financial self-control serves as an internal mechanism that bridges the gap between knowledge and actual financial behavior.

The results indicate that financial self-control strengthens the relationship between risk perception and over-indebtedness. This finding can be explained by the characteristics of the respondents, who are relatively young and highly educated, for whom risk perception does not always function as a deterrent to debt behavior but rather as part of a decision-making process perceived as rational. Respondents holding a bachelor's degree (S1) tend to possess the cognitive ability to understand the risks associated with online loans, such as interest rates, penalties, and the consequences of default. However, given their relatively limited income levels, awareness of these risks is not always accompanied by the capacity to avoid debt. In this context, financial self-control fosters the belief that risks can be managed through future payment arrangements. This finding is consistent with the study by Susilowati & Lutfi (2024), which shows that risk perception does not necessarily suppress debt behavior among young individuals in their productive years. Therefore, financial self-control in this context does not fully function as a protective factor but may reinforce individuals' confidence in undertaking conscious financial risks, particularly when debt is perceived as a temporary solution to income constraints.

Furthermore, the findings indicate that financial self-control does not significantly moderate the relationship between behavioral bias and over-indebtedness. This result is consistent with the effect size (f^2) analysis, which shows that behavioral bias has the largest effect ($f^2 = 0.169$) compared to other variables, while the moderating effect of financial self-control remains weak ($f^2 < 0.02$). These findings suggest that behavioral bias exerts a more dominant influence than self-control mechanisms in explaining over-indebtedness, particularly among younger respondents. Within the 24–30 age group, individuals are typically in a phase of lifestyle exploration and social identity formation, making them more susceptible to impulsivity, present bias, and social pressure. Despite possessing an undergraduate level of education and relatively good financial self-control, respondents tend to make emotionally driven debt decisions, especially when online lending platforms offer ease of access and instant disbursement. These findings are consistent with those of Candika et al. (2025) and Siregar et al. (2022), who emphasize that behavioral bias is a primary determinant of over-indebtedness and is difficult to mitigate solely through financial self-control. Overall, this evidence reinforces the behavioral accounting perspective that psychological biases operate automatically and often override cognitive control, particularly in short-term financial decision-making.

5. CONCLUSION, IMPLICATION, SUGGESTION, AND LIMITATIONS

This study concludes that financial literacy, risk perception, and behavioral bias significantly influence over-indebtedness among online lending users. Behavioral bias was identified as the most dominant factor. In addition, financial self-control plays a moderating role in certain relationships, indicating that internal control mechanisms are relevant in shaping financial behavior, although their effects are not uniformly significant across all variables.

These findings imply that over-indebtedness in digital lending cannot be explained solely by rational financial knowledge or risk awareness. Instead, behavioral factors and self-control mechanisms play a critical role in determining how individuals manage debt. Therefore, understanding over-indebtedness requires an integrated perspective that combines cognitive, psychological, and behavioral dimensions of over-indebtedness.

From a practical standpoint, several implications can be drawn. First, financial education programs should be redesigned to incorporate behavioral components, such as self-control training and awareness of cognitive biases, rather than focusing solely on financial knowledge. Second, regulators and policymakers should strengthen consumer protection in online lending through stricter risk disclosures, borrowing limits, and early warning systems to prevent excessive debt accumulation. Third, fintech providers are encouraged to adopt responsible design features, such as repayment simulations, cooling-off periods, and behavioral nudges, to reduce impulsive borrowing. Finally, individuals need to enhance their financial self-control to ensure that financial decisions are aligned with their long-term financial capacity.

This study had several methodological limitations. The use of self-reported questionnaire data may introduce response bias, particularly a social desirability bias. The purposive sampling technique limits the representativeness of the sample, thereby affecting the generalizability of the findings of this study. In addition, the study focuses on a relatively narrow demographic group, namely young adults aged 24–30 years with moderate income levels, which may not reflect the broader population's behavior. The absence of control variables, such as financial stress, income stability, or socioeconomic background, may also result in omitted variable bias. Furthermore, the cross-sectional design restricted the ability to capture causal relationships and behavioral changes over time.

Based on these limitations, future research is recommended to employ longitudinal approaches to better understand the dynamics of over-indebtedness behavior. Further studies should also include more diverse respondent characteristics and incorporate additional psychological and socio-economic variables, such as financial stress, self-efficacy, and social influence, to provide a more comprehensive explanation of digital borrowing behavior.

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