



Research Article

Social Science

**A CONFIRMATORY FACTOR ANALYSIS OF
TRANSFORMATIONAL LEADERSHIP AND PERSONAL
FINANCIAL MANAGEMENT AMONG THAI NURSING
STUDENTS**

泰国护理专业学生变革型领导与个人财务管理的验证性因子分析

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Abstract:

This quantitative cross-sectional study investigated whether transformational leadership is associated with personal financial management among nursing students and tested the fit of the proposed measurement model. A total of 536 first-year nursing students from Thailand's central northeastern region were selected through stratified random sampling. Data were collected using

a 55-item, five-point Likert questionnaire comprising five dimensions of transformational leadership (25 items) and five dimensions of personal financial management (30 items). Content validity was confirmed by five experts (IOC = 0.80–1.00), and internal consistency was excellent (Cronbach's alpha = 0.98). Confirmatory factor analysis (CFA) was performed using Mplus 8.11. The model demonstrated a very good fit to the data ($\chi^2 = 53.783$, $df = 29$, $p = 0.0034$, $\chi^2/df = 1.85$, CFI = 0.990, TLI = 0.985, RMSEA = 0.040, SRMR = 0.025). Standardized factor loadings ranged from 0.815 to 0.844 for transformational leadership and from 0.615 to 0.896 for personal financial management. A strong positive correlation was identified between the constructs ($r = 0.822$, $p < 0.001$). The findings indicate that higher levels of transformational leadership are associated with more effective financial management behaviors among nursing students. By extending transformational leadership theory into the domain of personal financial behavior, this study underscores the importance of integrating leadership development into nursing education to strengthen professional readiness and long-term financial competence.

Keywords: Confirmatory Factor Analysis, Transformational Leadership, Personal Financial Management, Nursing Students

摘要

本研究采用横断面定量研究方法，探讨变革型领导与护理专业学生个人财务管理之间的关联，并检验所提出的测量模型的拟合度。研究采用分层随机抽样方法，选取了泰国东北地区中部 536 名一年级护理专业学生。数据收集采用包含 55 个题项的五点李克特量表问卷，问卷包含变革型领导的五个维度（25 个题项）和个人财务管理的五个维度（30 个题项）。问卷的内容效度经五位专家验证（IOC=0.80 - 1.00），内部一致性极佳（克隆巴赫 α 系数 = 0.98）。研究采用 Mplus 8.11 软件进行验证性因子分析（CFA）。该模型与数据拟合度良好（ $\chi^2 = 53.783$ ， $df = 29$ ， $p = 0.0034$ ， $\chi^2 / df = 1.85$ ，CFI = 0.990，TLI = 0.985，RMSEA = 0.040，SRMR=0.025）。变革型领导的标准化因子载荷介于 0.815 至 0.844 之间，个人财务管理的标准化因子载荷介于 0.615 至 0.896 之间。两个构念之间存在显著的正相关关系（ $r=0.822$ ， $p < 0.001$ ）。研究结果表明，护理学生展现出越高水平的变革型领导力，其个人财务管理行为越有效。本研究将变革型领导力理论拓展至个人财务行为领域，强调了将领导力发展融入护理教育的重要性，以增强护理专业的职业素养和长期财务能力。

关键词：验证性因素分析；变革型领导；个人财务管理；护理专业学生

I. INTRODUCTION

Global public debt has continued to rise steadily, exerting widespread and profound effects on the global economy and society. Developing countries are particularly vulnerable, as public debt in these economies accounts for approximately 60% of total economic output [1]. The accumulation of public debt has accelerated markedly since the COVID-19 crisis in late 2020 [2], pushing the global economy into recessionary conditions characterized by high inflation, declining quality of life, and deteriorating household well-being. In many cases, debt has been incurred as a survival mechanism during times of crisis.

Thailand has been significantly affected, with a household debt-to-gross domestic product (GDP)

ratio of 91.65%, ranking seventh globally and third in Asia after South Korea and Hong Kong [3]. Of particular concern is that the majority of household debt consists of non-income-generating liabilities, especially personal loans and credit card debt, which account for a disproportionately large share compared to income-generating loans such as business investment financing. In addition, non-performing loan (NPL) rates among certain borrower groups remain at worrying levels, reflecting financial fragility within the household sector and posing potential long-term risks to economic stability [4].

This situation underscores the urgent need for systematic solutions to household debt, particularly among adolescents, young adults, and early-career workers (First Jobbers) aged 20–35

years. This demographic exhibits the highest proportion of non-income-generating debt and a non-performing loan rate of up to 25% [5]. Adolescence represents a transitional phase from childhood to adulthood, involving significant physical, psychological, and emotional changes [6]. Financial vulnerability among adolescents and university students is further reflected in elevated stress levels, especially among higher-education students who are navigating transitions related to academic demands, employment prospects, economic conditions, political contexts, values, and cultural expectations. Economic and financial factors have been identified as major sources of stress, accounting for 43.33% of reported stress among students [7].

University life also marks a transition toward financial independence. Rising tuition fees and living expenses expose students to long-term financial risks [8]. Consequently, students are considered particularly vulnerable to post-graduation financial instability and substantial debt burdens [9]. Research examining the causal factors of student indebtedness indicates that expected post-graduation income is the most influential determinant, followed by living expenses, consumerist behaviors, attitudes toward economic conditions, financial pressure, and family socioeconomic status [10]. These factors undermine effective personal financial management and contribute to heightened stress, particularly among nursing students.

Nursing students occupy a vital position within the healthcare system and are exposed to considerable academic and clinical pressures. Syntheses of research on stress among nursing students have identified six principal contributing factors: resilience capacity, academic and clinical training demands, participation in institutional activities, spiritual development and meditation practices, family-related influences, and communication between instructors and students, all of which require continuous institutional support to reduce stress and enhance academic achievement [11]. Furthermore, nursing students demonstrate higher rates of depressive symptoms compared to other student groups, attributable to academic stress, fear of the future, and personal challenges [12], particularly romantic relationships, family expectations and pressure, and financial difficulties [13]. At the professional level, nurses themselves carry substantial debt, with an indebtedness rate of 82.6% and an average debt exceeding 300,000 Thai baht, largely stemming from personal loans, housing loans, and education-related debt [14].

Within this context, transformational leadership represents a crucial process through which individuals can develop themselves, adapt to changing circumstances, and foster positive change among others [15]. While transformational leadership has been extensively examined in organizational and managerial settings, limited empirical research has explored its structural relationship with personal financial management at the individual level, particularly within professional health education. Moreover, few studies have simultaneously validated the measurement properties of both constructs using confirmatory factor analysis in a higher-education context. Addressing this gap, the present study investigates whether transformational leadership is associated with personal financial management among nursing students and tests the fit of the proposed measurement model. By integrating leadership theory with financial behavior research in a non-organizational educational setting, this study offers an interdisciplinary extension of transformational leadership theory and provides empirical evidence relevant to both leadership development and financial capability frameworks.

The study developed a conceptual framework to depict the structural relationship between transformational leadership and personal financial management. Each construct consists of five components, and the model illustrates how these two domains are interconnected within the student context, as presented in Figure 1.

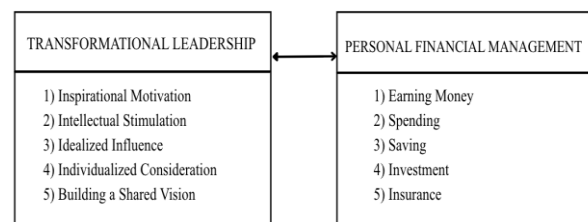


Figure 1. Conceptual framework

II. RESEARCH OBJECTIVES

This research aims to examine the relationship between transformational leadership and personal financial management among nursing students while simultaneously evaluating the goodness-of-fit of the proposed measurement model against empirical data.

III. RESEARCH METHODOLOGY

This study employed a quantitative cross-sectional design. The research process began with an extensive review of relevant literature, theoretical perspectives, and before empirical findings. Based on this synthesis, key dimensions and indicators were identified. Transformational

leadership was conceptualized as a five-dimensional construct comprising: (1) Inspirational Motivation, (2) Intellectual Stimulation, (3) Idealized Influence, (4) Individualized Consideration, and (5) Building a Shared Vision. Personal financial management was similarly structured into five domains: (1) Earning Money, (2) Spending, (3) Saving, (4) Investment, and (5) Insurance. These components informed the development of the research instrument. Content validity was evaluated by five experts using the Index of Item, Objective Congruence (IOC). The instrument was subsequently pilot-tested to assess item discrimination and internal consistency before full-scale data collection. Confirmatory Factor Analysis (CFA) was conducted to validate the measurement structure. The overall research procedure is illustrated in Figure 2.

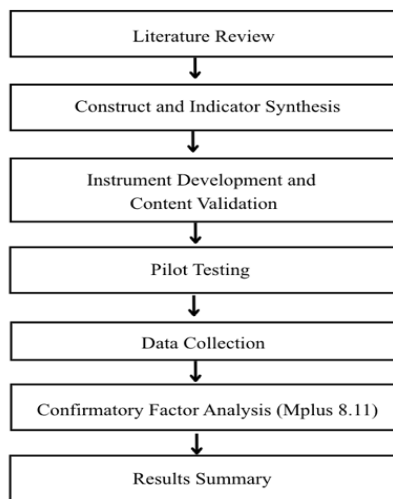


Figure 2. Research procedure.

A. Population

The population consisted of first-year nursing students enrolled in six higher education institutions across four provinces in the central northeastern region of Thailand, Kalasin, Khon Kaen, Maha Sarakham, and Roi Et. This region was selected due to the diversity of public and private nursing institutions and its comparatively lower average income and higher economic vulnerability relative to other regions of the country [16]. The total population comprised 3,199 first-year nursing students, based on official enrollment records for the 2025 academic year.

B. Sample

First-year nursing students were selected because they are in a transitional stage toward early adulthood, often beginning to manage their finances independently while still relying on

family support and without formal education in finance or business. Sample size was calculated using the criterion of 15 participants per estimated parameter (33 observed variables), yielding a minimum of 495 cases. To enhance statistical power, the sample size was increased to 550. Stratified random sampling was applied, with proportional allocation based on the number of students in each institution.

C. Research Instrument

Data were collected using a structured questionnaire divided into three sections:

Section 1: Demographic and background information, including gender, age, institution, income, primary income source, adequacy of income for daily living, student loan status, spending plans, major expense category, and perceived financial management competence (checklist format).

Section 2: Items measuring transformational leadership and personal financial management using a five-point Likert scale ranging from “highest level of practice” to “lowest level of practice.” This section comprised 55 items.

Section 3: Two open-ended questions soliciting additional comments and suggestions.

D. Instrument Validation

Content validity was assessed by five experts, yielding an IOC value of 0.98. The instrument was pilot-tested with 30 nursing students at Ratchathani University, Udon Thani Campus. The internal consistency reliability demonstrated a Cronbach’s alpha coefficient of 0.97.

E. Data Collection

Data were collected in coordination with designated representatives at each institution, who assisted in distributing the online survey link to eligible students. Participation was entirely voluntary and had no bearing on academic performance or student status. The questionnaire required approximately 30 minutes to complete. Only fully completed responses were included in the analysis. After screening for completeness, 536 valid questionnaires were retained, representing a response rate of 97.45%.

F. Data Analysis

Descriptive statistics were first used to summarize the general characteristics of the participants. Inferential analysis was then conducted using Confirmatory Factor Analysis (CFA) with Mplus Version 8.11 [17] to examine how well the measurement model fit the observed data. Model fit was evaluated based on χ^2/df , CFI,

TLI, RMSEA, and SRMR, following commonly accepted SEM criteria. Construct validity was assessed through standardized factor loadings, composite reliability (CR), average variance extracted (AVE), and established criteria for discriminant validity.

The measurement model was specified so that each indicator loaded only on its intended latent construct, with no cross-loadings allowed. For identification, one loading per construct was fixed at 1.0.

G. Ethical Considerations

Ethical approval was obtained from the institutional research ethics committee prior to data collection. Participants were informed of the study's purpose, the confidentiality of their responses, and their right to withdraw at any time. Informed consent was obtained electronically before they proceeded to complete the questionnaire.

IV. RESEARCH RESULTS

A. Measurement Model Fit

Confirmatory factor analysis (CFA) was conducted to evaluate the measurement model

comprising Transformational Leadership and Personal Financial Management. Model fit was assessed using recommended SEM indices [18], [19]. The model demonstrated good fit to the data: $\chi^2(29) = 53.783$, $p = 0.0034$; $\chi^2/df = 1.85$; CFI = 0.990; TLI = 0.985; RMSEA = 0.040; SRMR = 0.025. Although the chi-square statistic was significant ($p = 0.0034$), this is common in moderate-to-large samples due to the sensitivity of the test statistic [20]. Overall, the results indicate excellent model adequacy.

Table 1 Summarizes the model fit statistics. The standardized measurement model is presented in Figure 3.

Fit Index	Value
χ^2 (df = 29)	53.783
χ^2/df	1.85
CFI	0.990
TLI	0.985
RMSEA	0.040
SRMR	0.025

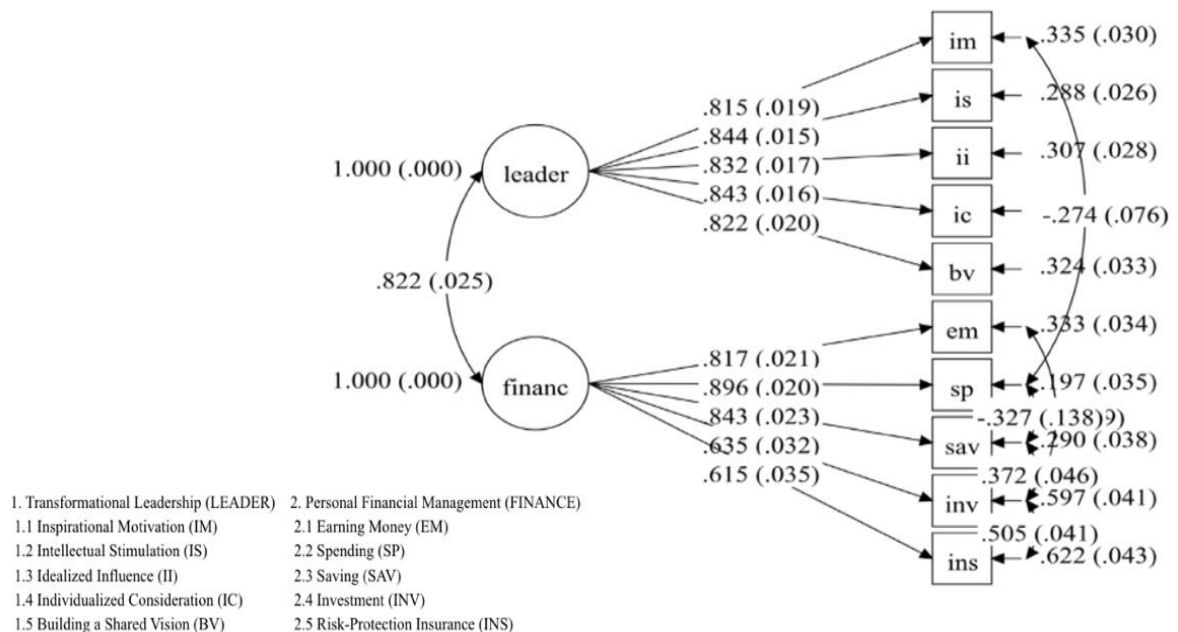


Figure 3. Confirmatory factor analysis model of transformational leadership and personal financial management among nursing students (standardized estimates).

B. Standardized Factor Loadings

All observed indicators loaded significantly on their respective latent constructs ($p < 0.001$),

supporting the adequacy of the measurement model. For Transformational Leadership, standardized factor loadings ranged from 0.815 to

0.844. Intellectual Stimulation demonstrated the highest loading ($\lambda = 0.844$), followed closely by Individualized Consideration ($\lambda = 0.843$), indicating that these dimensions strongly represent the construct. For Personal Financial Management, standardized loadings ranged from 0.615 to 0.896. Spending showed the strongest loading ($\lambda = 0.896$), underscoring its central role within the construct. Although the loadings for Investment ($\lambda = 0.635$) and Insurance ($\lambda = 0.615$)

were slightly below the conventional 0.70 threshold [18], both indicators were statistically significant and theoretically essential components of personal financial management. Squared multiple correlations (R^2) ranged from 0.38 to 0.80, indicating moderate to substantial explanatory power across indicators. Detailed loading estimates, standard errors, and R^2 values are presented in Table 2.

Table 2. Standardized Factor Loadings and Squared Multiple Correlations

Construct	Indicator	Standardized Loading (λ)	S.E.	t-value	R^2
Transformational Leadership	IM	0.815	0.019	42.89***	0.66
	IS	0.844	0.015	56.27***	0.71
	II	0.832	0.017	48.94***	0.69
	IC	0.843	0.016	52.69***	0.71
	BV	0.822	0.020	41.10***	0.68
Personal Financial Management	EM	0.817	0.021	38.90***	0.67
	SP	0.896	0.020	44.80***	0.80
	SAV	0.843	0.023	36.65***	0.71
	INV	0.635	0.032	19.84***	0.40
	INS	0.615	0.035	17.57***	0.38

Note: *** $p < 0.001$. λ = standardized factor loading; S.E. = standard error; R^2 = squared multiple correlation. All loadings were statistically significant. No cross-loadings were permitted.

C. Inter-Indicator Correlations

Inter-indicator correlations were examined in response to the reviewer’s recommendation. The results indicated that all correlation coefficients were positive and statistically significant ($p < 0.001$). Within the transformational leadership construct, correlations ranged from 0.660 to 0.722. For personal financial management, inter-

indicator correlations ranged from 0.464 to 0.718. Correlations across the two constructs ranged from 0.359 to 0.641.

These coefficients reflect meaningful conceptual associations among the indicators. Importantly, all correlations were below the threshold of 0.85, which is commonly used to assess potential multicollinearity in SEM. Detailed results are presented in Table 3.

Table 3 Correlation Matrix of Observed Indicators

	IM	IS	II	IC	BV	EM	SP	SAV	INV	INS
IM	1.000									
IS	0.722	1.000								
II	0.666	0.709	1.000							
IC	0.686	0.722	0.684	1.000						
BV	0.660	0.669	0.698	0.693	1.000					
EM	0.579	0.575	0.599	0.569	0.612	1.000				
SP	0.527	0.585	0.641	0.632	0.631	0.718	1.000			
SAV	0.509	0.551	0.560	0.573	0.591	0.699	0.687	1.000		
INV	0.362	0.375	0.440	0.382	0.479	0.533	0.583	0.694	1.000	
INS	0.359	0.388	0.387	0.400	0.445	0.464	0.568	0.533	0.703	1.000

Note: N = 536. All coefficients are Pearson correlations. All correlations are statistically significant at $p < 0.001$ (two-tailed).

D. Convergent and Discriminant Validity

Convergent validity was assessed using Composite Reliability (CR) and Average Variance Extracted (AVE), following established SEM guidelines [18]. Both constructs demonstrated satisfactory composite reliability, exceeding the recommended threshold of 0.70. Transformational Leadership: CR = 0.918, Personal Financial Management: CR = 0.877.

In addition, AVE values for both constructs exceeded the minimum criterion of 0.50, Transformational Leadership: AVE = 0.691, Personal Financial Management: AVE = 0.592. These findings support adequate convergent validity.

Discriminant validity was evaluated using the Fornell–Larcker criterion [21]. The square root of AVE for Personal Financial Management (0.770) was slightly lower than the inter-construct correlation ($r = 0.822$). Although this does not fully satisfy the criterion, the marginal difference may reflect a strong conceptual linkage between the two constructs rather than measurement redundancy. Considering the theoretical framework, which clearly distinguishes transformational leadership from personal financial management as conceptually separate domains, the constructs can still be regarded as exhibiting acceptable discriminant validity within the context of this study. Results are reported in Table 4.

Table 4. Composite Reliability (CR), Average Variance Extracted (AVE), and Discriminant Validity Assessment (Fornell–Larcker Criterion)

Construct	CR	AVE	1	2
1. Transformational Leadership	0.918	0.691	0.831	0.822
2. Personal Financial Management	0.877	0.592	0.822	0.770

Note: Diagonal elements (in bold) represent the square root of AVE. Off-diagonal elements represent inter-construct correlations.

E. Latent Construct Correlation

A strong positive association was observed between Transformational Leadership and Personal Financial Management ($r = 0.822$, S.E. = 0.025, $t = 32.88$, $p < 0.001$). The magnitude of this coefficient reflects a substantial relationship between the two constructs. As the analysis is correlational, no causal inference is implied.

Overall, the measurement model demonstrated sound psychometric properties and was deemed suitable for subsequent structural analysis.

V. DISCUSSION

The findings indicate that the proposed measurement model of transformational leadership and personal financial management demonstrates a strong fit with the empirical data. A statistically significant positive association was identified between the two constructs among nursing students, suggesting a meaningful conceptual linkage between transformational leadership orientation and financial management behavior within the higher education context.

With regard to transformational leadership, the confirmatory factor analysis supported its five-dimensional structure. Intellectual stimulation exhibited the highest standardized loading, underscoring the role of critical inquiry, analytical thinking, and reflective evaluation in shaping

leadership orientation. This finding aligns with theoretical perspectives that identify cognitive activation and intrinsic motivation as central mechanisms of transformational leadership [22]. It is also consistent with prior research indicating that nursing leaders frequently display transformational characteristics, with intellectual stimulation emerging as particularly prominent [23]. Although such studies were conducted within organizational nursing contexts, the present results suggest that the influence of transformational leadership may extend beyond workplace settings and contribute to students' self-directed development. Evidence from research on nurse well-being further reinforces this interpretation. Transformational leadership and organizational justice have been shown to significantly predict nurses' quality of work life [24], implying that visionary and fair leadership fosters positive professional outcomes. Similarly, leaders who inspire, intellectually engage, and provide individualized consideration have been found to shape followers' attitudes and constructive behaviors in meaningful ways [25]. While these studies focus on professional environments, the present findings suggest that comparable psychological processes may already be active during the academic stage of professional formation. At the same time, despite the strong loading observed for intellectual

stimulation, the cross-sectional design does not permit causal conclusions. Whether cognitive stimulation operates as a developmental driver over time remains an empirical question that requires longitudinal investigation. Research examining students' perceptions of transformational leadership further supports its developmental relevance. Transformational leadership, comprising idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration, has been shown to play a significant role in fostering students' academic growth and learning outcomes [26]. By strengthening academic engagement and self-belief, transformational leadership may enhance students' confidence in initiating personal change.

The substantial latent correlation between transformational leadership and personal financial management ($r = 0.822$) indicates a strong structural linkage between the two higher-order constructs. Although causality cannot be inferred within a cross-sectional framework, the magnitude of this association suggests that both constructs may share underlying psychological mechanisms, such as self-regulation, goal orientation, and future-directed thinking. Prior student-focused research has demonstrated that financial knowledge and social influence significantly shape saving behavior and financial management, with financial literacy exerting a direct effect on saving behavior through structural modeling [27]. However, knowledge alone may be insufficient. Without motivational and self-regulatory capacities, core components of transformational leadership, financial competence may not translate into sustained behavioral change. The present findings, therefore, imply that students' financial management reflects not only cognitive knowledge but also broader leadership-related developmental capacities. Evidence from healthcare professionals further supports this interpretation. Positive associations have been identified between financial literacy and leadership skills among medical personnel [28], suggesting a mutually reinforcing relationship between leadership potential and financial competence. While prior research has focused on practicing professionals, the present study demonstrates that this linkage may emerge during the educational phase, indicating that leadership capacity and financial capability may develop in tandem before workforce entry.

Within the personal financial management construct, spending control and saving behavior displayed the strongest factor loadings, highlighting budgeting discipline and systematic saving as central elements of financial behavior

among nursing students. This pattern aligns with prior findings indicating that financial knowledge and positive financial attitudes contribute to appropriate financial management behaviors [29]. Extending this literature, the current results suggest that financial behavior may be embedded within a broader framework of self-development shaped by leadership orientation.

From a theoretical perspective, this study offers three contributions. First, it extends transformational leadership theory beyond organizational settings to the domain of individual financial behavior, positioning leadership as a self-directed resource for personal change. Second, it integrates transformational leadership and personal financial management within a structural equation modeling framework, providing empirical support for a higher-order measurement structure. Third, it confirms convergent and discriminant validity of the proposed model within a healthcare student population, where structural modeling evidence remains limited.

Several limitations warrant consideration. The strong association observed may partially reflect unmeasured latent variables, such as personality traits or self-efficacy. In addition, reliance on self-reported data introduces the potential for social desirability bias, and the cross-sectional design restricts temporal interpretation. Future research should adopt longitudinal designs and multi-group SEM to evaluate model stability across contexts and extend the investigation to other professional student populations.

From a practical standpoint, the findings suggest that higher education institutions may benefit from integrating transformational leadership development with financial management training. Learning activities incorporating goal setting, planning exercises, reflective practice, and scenario-based learning may strengthen students' self-regulatory capacities and promote disciplined financial behavior before professional entry.

VI. RECOMMENDATIONS

The strong positive association identified between transformational leadership and personal financial management underscores the importance of cultivating internal capacities such as critical thinking, goal setting, and self-regulation within higher education. Universities, particularly nursing programs, should consider integrating leadership development with financial capability education. Learning activities that encourage analytical reasoning, reflective practice, and long-term planning may simultaneously strengthen

students' self-regulatory skills relevant to financial decision-making. In addition, institutions could design practical programs that connect life planning with financial planning. Activities such as personal budgeting exercises, risk assessment workshops, savings and investment planning modules, and the use of age-appropriate digital learning tools may enhance students' financial resilience prior to entering professional practice. Establishing accessible financial counseling services, especially for students experiencing economic vulnerability, would further help mitigate the risk of future debt-related challenges.

Future research should adopt longitudinal designs to examine the dynamics of the relationship over time. Multi-group structural equation modeling may also be employed to test model invariance across academic disciplines or regional contexts. Incorporating mixed-methods approaches could provide deeper insight into the underlying psychological mechanisms linking leadership capacities with financial behaviors.

VII. CONCLUSION

This study demonstrates that transformational leadership and personal financial management exhibit strong measurement validity and are substantially associated among nursing students. The findings highlight a meaningful linkage between leadership-related self-regulatory capacities and financial behaviors in higher education. Academically, the study extends transformational leadership theory beyond organizational contexts to individual financial behavior within professional health education, supported by rigorous validation procedures. Although causality cannot be inferred from the cross-sectional design, the results provide a basis for integrating leadership development with financial capability education and encourage future structural research across diverse educational and cultural settings.

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DECLARATIONS

Author Contributions

Conceptualization, C.S., and P.T.; methodology, C.S., and S.S.; software, K.P.; validating, C.S., and K.P.; formal analysis, P.T., and C.S.; investigation, C.S., and K.P.; resources, C.S.; data curation, C.S., and K.S.; writing original draft preparation, all authors contributed equally; writing-review and editing, C.S.; visualization, K.C., and K.P.; supervision, P.T.; project administration, C.S. All authors have read and agreed to the published version of the manuscript.

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Ethical Compliance

Certification: This research has been certified for human research ethics by the Human Research Ethics Committee, Graduate Studies, College of Asian Scholars, No. CASHE 6804001, with a certification period from July 16, 2025, to July 16, 2026.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Conflicts of Interest

The authors declare no conflict of interest.

Competing Interests

The authors confirm that no competing interests exist.

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