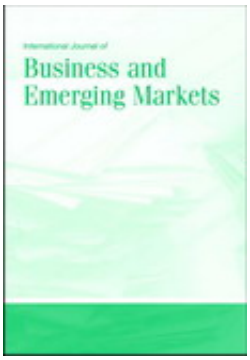

International Journal of Business and Emerging Markets

ISSN online: 1753-6227 - ISSN print: 1753-6219
https://www.inderscience.com/ijbem

Development of a financial behaviour model: a PLS-SEM approach

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DOI: 10.1504/IJBEM.2025.10074684

Article History:

Received:	07 August 2025
Last revised:	08 October 2025
Accepted:	10 October 2025
Published online:	21 November 2025

Development of a financial behaviour model: a PLS-SEM approach

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Abstract: This study investigates the influence of financial knowledge, financial attitude, and financial technology on individuals' financial behaviour within the context of an increasingly digital financial environment. Data were collected through a structured online survey administered between June and July 2024. The questionnaire comprised two main sections: demographic information and measurement items related to the proposed constructs. To test the hypothesised relationships, partial least squares structural equation modelling (PLS-SEM) and the PLS predict technique were employed. The findings provide empirical support for all three hypotheses, indicating that financial knowledge, financial attitude, and financial technology each have a direct and positive effect on financial behaviour. The study contributes to the existing literature on financial behaviour and offers practical implications for educators, policymakers, and fintech developers aiming to promote financial well-being through targeted interventions and digital innovation.

Keywords: financial behaviour; FB; financial knowledge; FK; financial attitude; FA; financial technology; PLS-SEM.

Reference to this paper should be made as follows: Çakërri, L., Petanaj, M. and Xhafaj, E. (2025) 'Development of a financial behaviour model: a PLS-SEM approach.', *Int. J. Business and Emerging Markets*, Vol. 17, No. 7, pp.1–14.

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1 Introduction

Studying personal financial behaviour (FB) is essential in today's ever-changing world, as it enables individuals to prioritise financial needs and plan effectively for their overall well-being. Financial well-being, characterised by confidence and satisfaction in one's financial outlook, is achieved through active engagement in responsible FB, ensuring a secure financial future (Ingale and Paluri, 2022).

FB plays a pivotal role in managing personal finances (Lusardi and Mitchell, 2014) and is broadly defined as" the planning, execution, and evaluation of financial activities, including cash flow management, savings, credit, investments, insurance, retirement and estate planning, and income management" Altfest (2004). It encompasses a range of actions and decisions related to financial matters, from short- and long-term investment choices to saving habits, credit use, spending patterns, and other practices (Nogueira et al., 2025). Furthermore, responsible FB involves areas such as income and expenditure management, forward planning, product selection, staying informed, asset protection, routine saving, and preparation for retirement (Atkinson et al., 2006).

Individual FB is tied to various key factors, including demographics, socioeconomic aspects, social influences, financial literacy (FL), financial capability (FC), and technological advancements (Johan et al., 2021; Schuchardt et al., 2007).

Multiple studies have explained FB from different perspectives. For instance, individual aspects of financial concepts such as FB associated with FC techniques (Cera et al., 2021). FB, financial attitude (FA), financial advice (FAD), financial knowledge (FK) and financial satisfaction (FS) related to individuals' FC (Khan et al., 2022). Numerous studies have established that FL, encompassing both knowledge and skills, plays a crucial role in improving FB (Barbić et al., 2019). Henager and Cude. (2019) identified a positive relationship between FK and skills and a range of FBs – both long-term, such as goal-setting, retirement planning, and saving, and short-term, including spending and building emergency savings. Furthermore, it is evident that financial education significantly enhances FL, which, in turn, shapes FB and satisfaction (Tennyson and Nguyen, 2001; Xiao and Porto, 2017). Empirical evidence also highlights the impact of FL on informed financial decision-making and FB (Grohmann, 2018).

While previous studies Cera et al. (2021); French et al. (2020), and Lusardi and Mitchell. (2014) have examined the effects of FK, FA, and technology on FB in various international contexts, no prior research has investigated these relationships within the Albanian context. This study contributes to the literature by providing the first empirical evidence from Albania that integrates FK, FA, and financial technology into a single behavioural framework using PLS-SEM. Moreover, the study is among the first to apply the PLS predict technique to evaluate the model's out-of-sample predictive performance in the domain of FB, thereby adding methodological novelty to the field.

The outcomes of this study are expected to assist policymakers in designing effective financial education programmes to strengthen individuals' financial decision-making and overall well-being. Thus, the originality of the current research focuses on:

1 examining the direct effects of FA and FK on FB

2 assessing the impact of financial technology, based on the unified theory of acceptance and use of technology (UTAUT), on individuals' FB.

2 Literature review

2.1 Financial knowledge

FK is broadly defined as an individual's understanding of microeconomics, macroeconomics, and personal finance (Atlas et al., 2019). Within the domain of personal finance, numerous studies have shown that FB is closely linked to FL. In particular, knowledge of financial markets and instruments has been found to significantly enhance individuals' financial decision-making and practices (Ndhlovu et al., 2025; Prakash and Hawaldar, 2024).

Lusardi and Mitchell's (2014) lifecycle model underscores the critical role of FK in shaping behaviour, suggesting that individuals with higher levels of knowledge are more likely to adopt responsible financial practices. Complementing this perspective, Batty et al. (2015) highlight that exposure to financial education can positively influence both attitudes and behaviours. Similarly, Hilgert et al. (2003) argue that greater FK serves as a catalyst for improved financial practices. Potrich et al. (2016) further reinforce this relationship by demonstrating that FK exerts a direct and positive effect on FB, ultimately facilitating sound decision-making and effective management of personal finances. Thus, the following hypothesis is proposed:

H1 FK has a significant influence on FB.

2.2 Financial technology

Financial technology, commonly referred to as 'FinTech,' represents an innovative financial service that has evolved alongside advancements in technology, enabling consumers to perform financial activities digitally (Sabri et al., 2024). In this context French et al. (2020) examine the impact of smartphone app usage on FB and conclude that FinTech positively contributes to the enhancement of individuals' FB by strengthening their FC in the UK. The rapid advancement of financial technology has led

to substantial transformations within the financial sector and has significantly influenced how individuals engage with their personal finances (Shi et al., 2024).

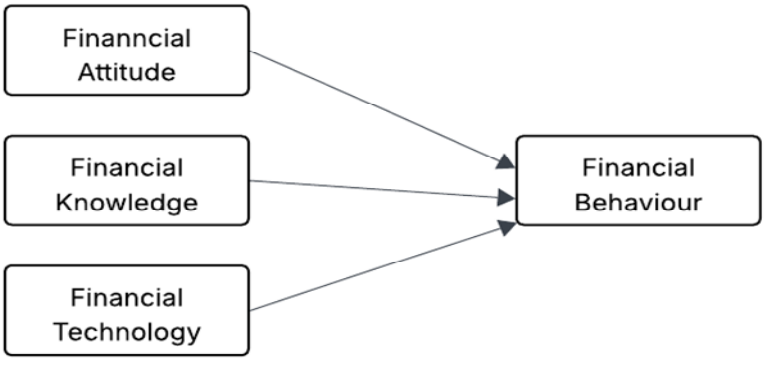
Lusardi et al. (2021), in the context of the USA, highlight the benefits of leveraging online technology to support financial decision-making. A consistent finding across these studies is that financial technology has served as a key catalyst in guiding individuals toward more informed, responsible, and sustainable FBs (Sabri et al., 2024).

H2 Financial technology has a significant influence on FB.

2.3 Financial attitude

Attitudes are a fundamental concept for understanding behaviour, as noted by Ajzen (1991). FA reflects 'an individual's cognitive and emotional perspective, encompassing their thoughts, beliefs, and judgements about financial issues' (Talwar et al., 2021a). A positive FA is particularly critical, as it directly influences various FBs and enhances FL (Bhargava et al., 2022). Dewi et al. (2020) further highlighted that FA and financial skills significantly affect FB, while FK does not have the same impact. Building on this, Cera et al. (2021) emphasised in their theoretical framework that FB is primarily shaped by FA.

Figure 1 Conceptual model



Moreover, an expanding body of empirical literature substantiates this relationship, demonstrating a significant correlation between FAs and FBs (Anggraini et al., 2022; Castro-González et al., 2020; Çera et al., 2021). These findings collectively underscore the importance of cultivating a positive FA as a foundation for responsible FB.

Thus, the following hypothesis is proposed:

H3 FA has a significant influence on FB.

3 Methodology

The data collection process was conducted online via Gmail and Facebook over two months from June to July 2024. A quantitative research approach was adopted to test the proposed hypotheses. Data were gathered using an online survey, organised into two sections. The first section contained questions aimed at capturing demographic variables,

while the second focused on indicators representing the four constructs of the proposed model. The questionnaire employed 5-point likert scales, ranging from 'strongly disagree' to 'strongly agree,' to quantify the construct elements.

In this study, FB and FA were each assessed through five items, adapted from the validated instruments developed by Khan et al. (2022) and Nabila et al. (2023). FK was measured using a four-item scale based on the work of Al Rahhleh (2023). Furthermore, financial technology was operationalised through 14 items adopted from Sabri et al. (2024).

Partial least squares structural equation modelling (PLS-SEM) is a powerful statistical technique that enables researchers to simultaneously estimate and test hypothesised relationships within a conceptual framework. This method facilitates the identification of potential correlations among multiple dependent and independent variables (Xhafaj et al., 2024). PLS-SEM is particularly suitable for empirical research due to several advantages: it performs well with small sample sizes, does not require data to follow a normal distribution, and accommodates variables measured on ordinal, nominal, or interval scales (Binsawad, 2020; Xhafaj et al., 2021).

The evaluation of PLS-SEM results is typically carried out in two distinct phases. The first phase involves the assessment of the measurement model, which examines the reliability and validity of the constructs. The second phase focuses on the structural model, where the hypothesised relationships among constructs are tested (Skaf et al., 2025; Xhafaj et al., 2025).

3.1 Measurement model

The assessment of the measurement model focuses on evaluating key psychometric properties, including indicator loadings, composite reliability (CR), average variance extracted (AVE), and the Heterotrait-Monotrait (HTMT) ratio of correlations (Qendraj et al., 2022). Indicator loadings above 0.708 are recommended, as they indicate that the construct explains more than 50% of the variance in each indicator, thus ensuring acceptable indicator reliability (Hair et al., 2019).

The AVE is a crucial metric for assessing convergent validity, as it quantifies the proportion of variance in the observed indicators that is attributable to the underlying latent construct. A commonly accepted threshold of AVE > 0.50 provides sufficient empirical evidence to confirm convergent validity (Benitez et al., 2020; Mooi, 2018).

In contrast, discriminant validity refers to the extent to which two latent constructs are statistically distinct and represent different theoretical concepts. To establish discriminant validity, researchers commonly examine the HTMT ratio. An HTMT value below 0.85 is generally interpreted as strong evidence of adequate discriminant validity (Benitez et al., 2020; Petanaj et al., 2025; Yadav et al., 2024).

3.2 Structural model

The next phase of the research focuses on the structural model assessment, which is conducted through hypothesis testing. This stage involves evaluating the significance of path coefficients and examining the coefficient of determination (R^2) to assess the model's explanatory power. To test the statistical significance of the hypothesised relationships, the bootstrapping resampling method was employed, using 5,000 sub-samples to ensure the robustness and reliability of the results (Shmueli et al., 2019).

3.3 PLS predict

PLS predict is a technique used to evaluate a model's out-of-sample predictive performance through ten-fold cross-validation (k = 10) with ten repetitions (r = 10) (Sohaib et al., 2020). Predictive accuracy is assessed using error metrics such as mean absolute error (MAE), mean absolute percentage error (MAPE), and root mean square error (RMSE). The method compares PLS-SEM predictions against two naïve benchmarks:

1 a linear model (LM)

2 the Q^2 statistic (Xhafaj et al., 2021).

Interpretation should focus on the key endogenous construct. First, Q^2 values must be greater than zero to confirm predictive relevance. Then, if the RMSE values from PLS-SEM are consistently lower than those from the LM benchmark, the model is considered to have high predictive power (Shmueli et al., 2019).

4 Results

A total of 220 individuals participated in the survey, with 43.2% identifying as male and 56.8% as female. The largest proportion of respondents (32.3%) fell within the 36–45 age group. Participants aged 26–35 accounted for 18.2%, those aged 20–25 comprised 20.3%, while 28.7% were between 46 and 55 years old. Only 0.5% of the respondents were above the age of 55. Regarding their place of residence, the majority (69.8%) reported living in urban areas, whereas 30.2% were from rural locations.

Table 1 presents the values for indicator loadings, CR, and average variance extracted (AVE). The indicator loadings, ranging from 0.717 to 0.87, mostly satisfied the recommended threshold of 0.70. The CR values demonstrated adequate internal consistency for all latent variables, each exceeding the 0.70 benchmark. Furthermore, the AVE values – ranging from 0.557 for FK to 0.81 for financial technology and 0.79 for FA – were all above the acceptable minimum of 0.50.

Table 2 presents the HTMT ratios, all of which fall below the 0.85 threshold. This outcome confirms that the constructs are empirically distinct from one another, thereby supporting the presence of discriminant validity.

The coefficient of determination (R^2) for FB is 0.644, indicating that the three associated latent constructs collectively account for 64.4% of the variance in FB.

As shown in Table 3, FK exerts a statistically significant and positive impact on FB ($\beta = 0.292$, $t = 3.915$, $p < 0.01$). Furthermore, FA displays a strong and meaningful association with FB ($\beta = 0.465$, $t = 6.606$, $p < 0.01$), thus lending empirical support to hypothesis H1. Additionally, the analysis confirms the direct influence of financial technology on FB, with a path coefficient of $\beta = 0.174$, $t = 2.167$, and $p < 0.01$, thereby supporting hypothesis H3. Figure 2 presents the hypothesised model along with the path coefficients corresponding to each proposed relationship.

The out-of-sample predictive capability of the model (Table 4) was evaluated through the PLS predict procedure. Initially, the analysis confirmed that all indicator-level Q^2 predict values exceeded zero, demonstrating adequate predictive relevance. Subsequently, the RMSE values derived from the PLS-SEM estimates were compared

with those from the LM. The lower RMSE values obtained via PLS-SEM indicate that the model exhibits stronger predictive accuracy than the LM benchmark.

Table 1 Evaluation of the reliability and validity of the measurement constructs

Constructs and indicators	*Outer loadings*	*CR*	*AVE*
Financial knowledge (FK)		0.896	0.590
FK1	0.761		
FK2	0.796		
FK3	0.801		
FK4	0.783		
Financial behaviour (FB)		0.859	0.604
FB1	0.79		
FB3	0.798		
FB4	0.788		
FB5	0.826		
Financial technology (FT)		0.946	0.598
FT1	0.798		
FT2	0.867		
FT3	0.886		
FT4	0.804		
FT5	0.805		
FT6	0.794		
FT7	0.779		
FT8	0.767		
FT9	0.870		
FT10	0.717		
FT11	0.795		
FT12	0.746		
Financial attitude (FA)		0.896	0.590
FA1	0.748		
FA2	0.815		
FA3	0.789		
FA4	0.714		
FA5	0.769		
FA6	0.771		

Table 2 Evaluation of discriminant validity via HTMT in the measurement model

	FA	*FB*	*FK*	*FT*
FA				
FB	0.782			
FK	0.824	0.755		
FT	0.596	0.613	0.576	

Figure 2 The proposed structural equation model and associated path coefficients (see online version for colours)

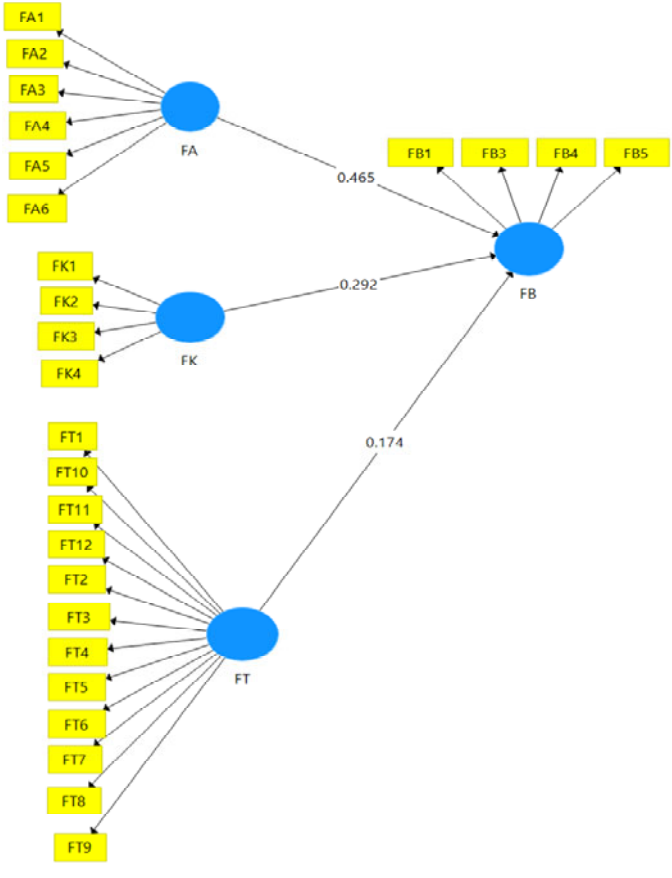


Table 3 Estimated path coefficients with corresponding significance levels

Hypothesis	*Path coefficients*	*P-values*	*T-statistic*
FA→FB	0.465	0.000	6.606
FK→FB	0.292	0.000	3.915
FT→FB	0.174	0.009	2.617

Table 4 Results of the PLS predict analysis for assessing out-of-sample predictive performance

Indicators	*RMSE*		*Q2*	
	PLS-SEM	*LM*	*PLS-SEM*	*LM*
FB1	0.696	0.736	0.272	0.186
FB3	0.461	0.494	0.511	0.437
FB4	0.778	0.882	0.235	0.016
FB5	0.607	0.681	0.429	0.282

5 Discussion

The findings of this study contribute to a deeper understanding of the factors influencing FB. Specifically, the research assessed the impact of FK, FA, and financial technology on individuals' financial actions. The analysis confirmed that all three hypothesised relationships (H1, H2, and H3) were statistically significant. Both FK and FA were positively associated with FB, indicating their essential roles in promoting sound financial practices. In addition, financial technology exhibited a direct and positive effect, underscoring its relevance in shaping contemporary financial decision-making.

The greater predictive influence of FA compared with FK can be explained by its role in shaping motivation, self-discipline, and readiness to act in financial contexts. Within the framework of the theory of planned behaviour (Ajzen, 1991), attitude functions as a direct driver of behaviour because it captures both affective and evaluative components that guide an individual's financial choices. Conversely, knowledge on its own represents an informational resource that does not necessarily result in behavioural change unless it is supported by positive attitudes and strong intentions (Norvilitis and MacLean, 2010). In many cases, individuals may understand the principles of sound financial management yet fail to apply them in practice without the emotional engagement or commitment that an appropriate attitude provides (Potrich et al., 2016). The relatively smaller yet significant influence of financial technology reflects its role as an external facilitator. Digital financial innovations – such as mobile banking, online payment systems, and personal finance applications – simplify daily financial activities and promote greater transparency and control (Rahi and Abd. Ghani, 2018). This observation is consistent with the UTAUT2, which posits that perceptions of usefulness and ease of use enhance behavioural intention (Venkatesh et al., 2012). In the Albanian setting, where digital transformation is still developing, technology supports behavioural change mainly by improving accessibility and efficiency (Bank of Albania, 2024).

FA appears to be a significant predictor of FB, indicating that individuals with a positive outlook toward financial matters are more likely to engage in responsible and proactive financial decision-making. These findings are consistent with those reported in prior research (Al Rahahleh, 2023b; Ali and Siddiqui, 2021; Potrich et al., 2016). Similarly, several studies have supported the association between FA and FB. For instance, research by Talwar et al. (2021) found that FA significantly influences the FB of retail investors. In addition, findings from Ali and Siddiqui. (2021) confirmed that the relationship between FA and FB is both statistically significant.

Additionally, the findings of this study indicate that FK has a significant and positive impact on individuals' FB. This suggests that those with higher levels of financial understanding are more likely to make responsible decisions and engage in sound financial practices. These results are consistent with the existing literature, which highlights the role of FK as a key factor in improving FB (Al Rahahleh, 2023; Hayhoe et al., 2005; Potrich et al., 2016; Yong et al., 2018).

The results also highlight the direct impact of financial technology on FB, emphasising the critical role that digital tools and platforms play in fostering responsible financial decision-making. The integration of technological innovations – such as mobile banking applications, online payment systems, and financial management platforms – has transformed the way individuals manage their finances. These technologies not only offer greater convenience and accessibility but also empower users to make more informed and timely financial decisions. By enhancing transparency, improving access to financial

information, and facilitating real-time transactions, financial technology serves as a catalyst for promoting sound financial practices. This finding aligns with previous research that recognises the growing influence of digital financial services in shaping consumer behaviour and improving financial wellbeing in an increasingly digitised economy (Sabri et al., 2024; Shi et al., 2024).

6 Conclusions

This study explored the influence of FK, FA, and financial technology on individuals' FB. The findings provide empirical support for all proposed hypotheses (H1, H2, and H3), demonstrating that each construct significantly contributes to shaping responsible financial actions. FK and FA emerged as key determinants, reinforcing their critical role in fostering sound financial practices. Moreover, the positive and direct impact of financial technology highlights its growing importance in facilitating informed and effective financial decision-making in the digital age. By employing PLS-SEM and PLS Predict, this research offers robust analytical insights and bridges an important gap in the literature, particularly regarding the integration of financial technology into behavioural finance models.

From a policy perspective, several concrete recommendations emerge. Educational institutions should integrate practical financial education and behavioural training modules into curricula to strengthen FK and positive attitudes from an early age. FinTech developers can contribute by creating user-oriented, transparent, and educational digital platforms that promote responsible saving, spending, and investment behaviours. Meanwhile, policymakers should promote national initiatives on digital financial education and develop regulatory frameworks that ensure trust, accessibility, and inclusion within the financial ecosystem. These targeted strategies can enhance FC and support sustainable improvements in individuals' FB.

7 Limitations and directions for future research

While this study deepens the understanding of the key factors influencing FB within an increasingly digital financial landscape, several limitations and practical implications should be acknowledged.

First, data collection through Gmail and Facebook provided an efficient and cost-effective means of reaching geographically dispersed participants; however, this convenience sampling method may have introduced sampling bias, overrepresenting younger and more digitally active individuals. Future research is therefore recommended to employ probability-based methods or mixed approaches (online and offline) to ensure better representativeness and higher external validity of the results.

Furthermore, the use of a cross-sectional research design limits the ability to draw causal relationships among the examined variables. Longitudinal studies could provide deeper insights into how FB evolves over time and under the influence of changing technological conditions. In addition, although this study focused on FK, FA, and financial technology, future research could incorporate psychological factors, social norms, and digital literacy, which may further explain the variance in FB.

Declarations

All authors declare that they have no conflicts of interest.

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Appendix

Financial attitude (FA) (Rai et al., 2019; Bhargava et al., 2022)
Financial planning is important to me. (FA1)
Having a financial plan helps in making informed decisions about financial investments. (FA2)
I am aware of the significance of financial investments. (FA3)
If I have money, I prefer to invest it in order to secure a stable future rather than spending it. (FA4)
It is essential to remain within the budget. (FA5)
The way money is managed today will have an impact on the future. (FA6)
Financial knowledge (FK) (Bhargava et al., 2022; OECD, 2020)
I understand the cost of purchasing on credit. (FK1)
I am quite proficient in calculations such as profit and loss, percentages, and related measures. (FK2)
Financial knowledge (FK) (Bhargava et al., 2022; OECD, 2020)
If prices rise quickly, the money people hold in savings accounts may lose a significant portion of its value. (FK4)
Financial behaviour (FB) (Dickason and Ferreira, 2018; Joo and Grable, 2000)
I follow a weekly or monthly plan for expenses. (FB1)
I compare prices when purchasing an item. (FB2)
I analyse my financial situation before making a major purchase. (FB3)
I record and monitor my personal expenses. (FB4)
I conduct a detailed assessment of financial products before investing. (FB5)