

The Impact of Digital Literacy on Financial Risk Asset Allocation in Chinese Households

Jing Yang, Yaru Liu, Qianyu Shen

College of Finance, Jiangxi Normal University, Nanchang, China

Abstract: Enhancing digital literacy has become a key national strategy of development in the era of digital economy and serves as a new engine for boosting residents' property income and achieving shared prosperity. This paper investigate how digital literacy affects household participation in financial markets and depth of household risk asset investments using data from China Family Panel Studies (CFPS) in 2016, 2018, and 2020. The findings reveal that digital literacy influences the household asset allocation toward financial risk. The study also shows that the effect of digital literacy on financial risk market participation decreases across high, middle, and low-asset households, while its depth of influence on the asset investment toward financial risk increases. Additionally, the impact of digital literacy on financial market participation decreases across households in the eastern, central, and western regions, with a similar trend observed in the asset investment toward financial risk across central, western, and eastern households.

Keywords: Digital literacy; Financial Risk Asset; Financial Risk Market Participation; Depth of Household Risk Asset Investments

1. Introduction

In recent years, the Chinese government has emphasized the goal of achieving "common prosperity," which is seen as an essential requirement of socialism. This goal coincides with the rapid development of the digital economy and its deep integration with the real economy. The rapid growth of the internet has transformed the financial market by reducing spatial and temporal barriers in financial services. Digital literacy refers to an individual's ability to use digital tools effectively, enabling them to acquire, identify,

and critically analyze digital information [1], which can significantly alter the channels through which family members access financial information and their investment perspectives, thereby impacting household asset allocation. In terms of household finance, digital literacy expands information channels and reduces the costs of obtaining financial information, making market participation easier for households. This, in turn, affects household risk financial investment decisions. As the internet rapidly develops and breaks down spatial and temporal barriers to financial services, how does digital literacy influence the allocation of financial risk assets?

With the increasing focus on digital literacy, the academic community is eager to explore its impact on Household Asset Allocation toward Financial Risk. However, there remains a significant gap in the research, and certain theoretical issues still require empirical validation. This paper's contributions are mainly reflected in the following aspects: First, from a research perspective, this paper builds on previous studies by treating digital literacy as an investable form of human capital, thus expanding the scope of research on factors influencing financial risk asset allocation. Second, in terms of methodology, this paper employs multiple empirical analysis methods. By reviewing human capital theory, portfolio theory, social network theory, and cognitive theory, and using data from the 2016, 2018, and 2020 China Family Panel Studies (CFPS), the study adopts the entropy-weighted TOPSIS method and utilizes Probit and Tobit models to explore the mechanisms by which digital literacy affects household risk asset allocation. This ensures the scientific rigor and credibility of the research.

The structure of the paper is as follows: Section 2 reviews the literature and provides theoretical analysis; Section 3 introduces the

empirical research design; Section 4 presents the main empirical results and analysis; Section 5 offers further analysis; and the final section concludes with policy implications.

2. Literature Review

Although existing literature varies in focus, the academic community generally agrees that “digital literacy” is a multidimensional concept. Most studies support the view that digital literacy is a comprehensive ability encompassing the skills to discover, access, evaluate, integrate, and communicate information using digital media [1,2]. On one hand, the European Union’s Digital Competence Framework 2.1 highlights that digital literacy should include five key areas: information and media literacy, communication and collaboration skills, digital content creation, data security, and the ability to choose appropriate digital tools to solve problems. On the other hand, existing research has examined the factors influencing Household Asset Allocation toward Financial Risk from three perspectives: household characteristics, investor characteristics, and the broader macroeconomic environment. Households’ income levels and their capacity to bear risk influence decisions regarding risk asset allocation [3,4]. Married households are more likely to increase the allocation of financial risk assets and raise the proportion of financial assets in their portfolios [5]. As age increases, household investment tends to follow an inverted “U” shape pattern [6-8]. Moreover, investors with different risk preferences vary in their asset allocation choices and their level of participation in financial markets [9]. From a macroeconomic perspective, Household Asset Allocation toward Financial Risk is significantly influenced by the broader economic environment [10]. Households are more inclined to invest in high-risk assets during periods of stable financial market development [11].

There has been limited research in China on the impact of financial literacy on Household Asset Allocation toward Financial Risk, but some studies have explored the influence of internet usage and digital inclusive finance on such allocations. Tsai H et al. examined the effects of internet usage and social interactions on household financial risk asset

choices, finding that both factors contribute to promoting household ownership of financial assets [12]. Some scholars have indicated that digital inclusive finance can improve the efficiency of household risk asset allocation by lowering the barriers to financial transactions [13], breaking through the geographical limitations of traditional financial institutions, and enhancing household access to credit loans [14], thereby increasing both the probability and extent of holding high-risk financial assets [7]. Zhou and Liang argued that the internet can enhance financial decision-making by reducing market frictions and lowering constraints on participation opportunities [15]. The Internet can improve residents’ financial decision-making ability by reducing market frictions and lowering participation opportunity constraints, while investor behavioral choices also have an impact on household asset allocation [15].

By reviewing existing studies, we find that research on the factors influencing household financial risk assets is relatively comprehensive, providing a solid foundation for this paper. However, there is still room for further development. First, most existing research focuses on external factors such as internet usage and digital inclusive finance in relation to Household Asset Allocation toward Financial Risk, while overlooking the role of “digital literacy” as an internal factor. Second, current studies on measuring digital literacy primarily focus on the education sector, with little attention given to evaluating digital literacy among the general population. In light of this, this paper takes digital literacy as a focal point and builds on the key tasks outlined in the Action Plan for Improving Digital Literacy and Skills for All issued by the Central Cyberspace Affairs Commission. Integrating previous research, the paper develops a comprehensive digital literacy evaluation framework for residents, incorporating three dimensions—general digital knowledge, daily life application, and occupational digital literacy—across 11 indicators, providing a new direction for measuring digital literacy.

3. Mechanism Analysis and Research Hypothesis

Digital skills refer to the ability to acquire,

understand, and utilize digital information through digital tools. These skills are considered part of human capital, contributing to income growth, altering income structures, and promoting social equity. According to human capital theory, the knowledge and skills an individual possesses can enhance income, reshape income distribution, and lead to a fairer allocation of resources. In the digital economy, households can leverage digital tools to allocate financial assets and increase income. Research has shown that household decisions regarding financial risk asset allocation depend on financial investment capabilities and digital literacy—specifically, the ability to use digital tools to access and identify product information. Digital literacy plays a crucial role in Household Asset Allocation toward Financial Risk: those with low digital literacy tend to have weaker abilities to assess and mitigate risks, leading to reduced investment in risky products. In contrast, individuals with high digital literacy are able to evaluate risks more accurately, reduce investment costs, and are more likely to participate in risk asset investments. Based on this, the first research hypothesis of this paper is proposed:

H1: Improvements in digital literacy promote household participation in risk asset investments.

According to modern portfolio theory, under fully rational conditions, investors will engage in diversified investments based on their expected returns and risk preferences, thus constructing an efficient investment portfolio. However, household decision-makers often operate under bounded rationality, and their investment decisions are influenced by social or personal factors. Existing research has confirmed that digital literacy has a significant positive impact on the participation of households, operating under bounded rationality, in financial risk markets. Weng et al. [16] found that digital literacy helps individuals recognize and understand emerging financial products, reducing the cost of processing financial information and promoting investments in risky financial market assets. This suggests that digital literacy can lower the cost of investing in risk assets, thereby increasing the depth of household investment in such assets. Based on this, we propose the second hypothesis of this

paper:

H2: Improvements in digital literacy will increase the depth of household risk asset investments.

4. Empirical Research Design

4.1 Data sources

The data used in this study comes from the China Family Panel Studies (CFPS) database. Since this study focuses on how digital literacy influences household risk financial asset allocation, the data selection prioritizes availability and the reflection of recent trends. Thus, data from the years 2016, 2018, and 2020 were incorporated into the analysis. After excluding outliers and missing data, the study obtained 31,661 valid samples.

4.2 Model Selection

This study explores the effect of digital literacy on Household Asset Allocation toward Financial Risk. Since the decision to hold financial risk assets is a binary outcome, a Probit model is chosen for the analysis. The model is structured as follows:

$$\text{Participant} = \begin{cases} 1, & \text{if } \text{Participant}_i^* > 0 \\ 0, & \text{if } \text{Participant}_i^* \leq 0 \end{cases} \quad (1)$$

$$\text{Participant}_i^* = \alpha + X_i' \beta + \mu_i \quad (2)$$

Here, Participant is a binary dummy variable, where it takes the value of 1 if the household holds risk financial assets, and 0 otherwise. Participant_i^* is a vector that includes the key explanatory variable (digital literacy) and a set of control variables. X_i' represents a vector that includes the key explanatory variable and a set of control variables. μ_i is the random disturbance term and β is the vector of estimated coefficients.

The depth of household allocation in risk assets is a continuous variable. Since many households have a value of 0 for this variable, indicating left-censored data, we apply a Tobit model for regression analysis. The specific model setup is as follows:

$$\text{Proportion} =$$

$$\begin{cases} \text{Proportion}_i^*, & \text{if } \text{Proportion}_i^* > 0 \\ 0, & \text{if } \text{Proportion}_i^* \leq 0 \end{cases} \quad (3)$$

$$\text{Proportion}_i^* = \alpha + X_i' \beta + \mu_i \quad (4)$$

Proportion_i^* represents the proportion of risk assets to total financial assets; X_i' includes the core explanatory variables and control

variables; μ_i is the random error term; and β represents the estimated coefficients.

4.3 Variable Definition

The depth of household participation in financial markets and the allocation of risky assets. Following the approach of Wang [17], this is measured by the ratio of the total value of risky financial assets held by households to the total value of all financial assets held by households. The total value of all financial assets is represented by the household's total

financial assets recorded in the CFPS (China Family Panel Studies) data.

Digital literacy is the core variable of this study. Digital literacy is the core variable of this paper. In this paper, a comprehensive evaluation index system of residents' digital literacy with 11 indicators is utilized from the four dimensions of digital generalization, life application, vocational knowledge and security literacy, and the specific indicators and variables of each dimension are described as shown in **Table 1**.

Table 1. Digital Literacy Indicator System

Dimension	Indicator	Variable Description
Digital General Literacy	Access to the Internet via Mobile Devices (X1)	Yes (1) / No (0)
	Access to the Internet via Computer (X2)	Yes (1) / No (0)
	Whether use Wechat (X3)	Yes (1) / No (0)
	Importance of the Internet as a Primary Information Channel (X4)	1-5 (1 Very Important - 5 Not Important at All)
Digital Lifestyle Application Literacy	Playing Online Games (X5)	Yes (1) / No (0)
	Watching Short Videos (X6)	Yes (1) / No (0)
	Importance of the Internet for Leisure and Entertainment (X7)	1-5 (1 Very Important - 5 Not Important at All)
	Importance of the Internet for Daily Life (X8)	1-5 (1 Very Important - 5 Not Important at All)
Digital Occupational Knowledge Literacy	Online Learning (X9)	Yes (1) / No (0)
	Importance of the Internet for Learning (X10)	1-5 (1 Very Important - 5 Not Important at All)
	Importance of the Internet for Work (X11)	1-5 (1 Very Important - 5 Not Important at All)

Note: The indicators used in this study are based on the most recent 2020 survey. Due to differences in some indicators in the 2016 and 2018 surveys, similar questions were used as substitutes.

Existing studies use multi-dimensional indicator systems to measure digital literacy, and this study employs the Entropy Weight-TOPSIS method to assess the multi-dimensional digital literacy level of Chinese residents.

Considering various factors that influence household allocation of risky financial assets as discussed earlier, this study selects three types of control variables based on data availability: household head variables, household-level variables, and regional-level variables. **Table 2**. presents the main variables and their descriptions used in this study.

5. Results

5.1 Descriptive Statistics

The descriptive statistics on household allocation in risky financial assets reveal that

the overall participation of Chinese households in financial markets is relatively low (**Figure 1**). Most households tend to adopt a risk-averse approach, and there are significant differences in the allocation of risky assets across households with varying levels of wealth. Following the methodology of Zhang, households are categorized into low-asset, middle-asset, and high-asset groups for analysis[18]. The results show that households with higher asset levels are more likely to invest in risky assets, likely due to their stronger risk tolerance and greater financial resources. However, in terms of the depth of risky asset allocation, low-asset households have the highest allocation, followed by middle-asset households, while high-asset households have the lowest depth of allocation.

Table 2. Variable Definitions and Descriptions

Variable Type	Variable Symbol	Variable Name	Definition
Dependent Variable	Participant_risk	Household Participation in Financial Markets	Whether the household holds risky assets (1 if yes, 0 if no)
	Proportion_risk	Depth of Household Investment in Risky Financial Assets	Proportion of risky assets to total financial assets
Core Explanatory Variable	Digital_literacy	Digital Literacy	Measured using the Entropy Weight-TOPSIS method
	General_literacy	General Literacy	Dimension of “General Literacy”
	Life_application_literacy	Lifestyle Application Literacy	Dimension of “Lifestyle Application Literacy”
	Professional_literacy	Professional Knowledge Literacy	Dimension of “Professional Knowledge Literacy”
Control Variables	Gender	Gender	1 for male, 0 for female
	Age	Age	Age of the household head in the corresponding year
	Marriage	Marital Status	1 if the household head is married, 0 otherwise
	Education	Education Level	0 for primary school or below, 1 for middle school, 2 for vocational school, 3 for university and above
	Health	Health Condition	Scale of 1-5, with 1 indicating poor health and 5 indicating very good health
	Family scale	Family Size	Number of household members
	Ln(family_wealth)	Total Household Wealth	Log of the total household wealth
	Ln(income)	Annual Household Income	Log of the household’s annual income
	Self-employ	Self-employment	Whether the household head is self-employed (1 for yes, 0 for no)
	House	Home Ownership	1 if the household owns a home, 0 if not
	Urban	Urban Household Registration	1 for urban registration, 0 for rural registration
	Ln(GDP)	Provincial GDP per Capita	Log of per capita GDP in the household head’s province

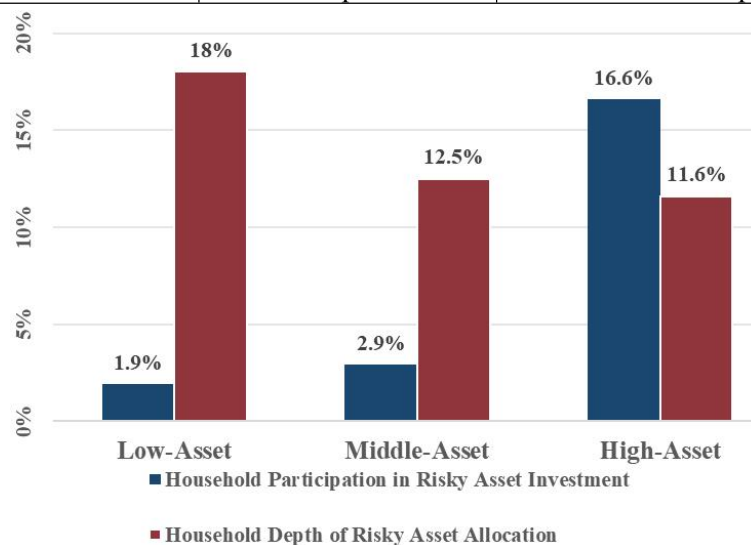


Figure 1. Household Allocation of Financial Risky Assets by Low, Middle, and High-Asset Groups

5.2 Baseline Regression Analysis

Table 3. presents the regression results of digital literacy on two dimensions of household risky financial asset allocation. Columns (1) and (2) show the regression results for household financial market participation, while Columns (3) and (4) present the regression results for the depth of household risky asset investment.

In Column (1) of **Table 3.**, with digital literacy as the explanatory variable, the coefficient is positive and statistically significant at the 1% level. In Column (2), after adding a series of control variables at the individual, household, and regional levels, the coefficient remains positive and significant at the 1% level. This suggests that higher levels of digital literacy significantly increase the likelihood of household participation in financial markets, supporting Hypothesis H1. A possible explanation is that individuals with higher digital literacy possess better abilities to search, browse, and access the digital information and resources they need. Coupled with their stronger ability to assess the risks and expected returns of financial products, this can greatly reduce the potential costs and risks that often prevent low-digital-literacy groups from entering risky financial markets. Therefore, improving digital literacy can encourage households to invest in risky assets. In Column (3), the coefficient for digital literacy as the explanatory variable is positive and statistically significant at the 1% level. Similarly, in Column (4), after adding various control variables at the individual, household, and regional levels, the coefficient remains positive and significant at the 1% level. This indicates that higher digital literacy significantly increases the depth of household

investment in risky assets, supporting Hypothesis H2. A potential reason is that more digitally literate investors are better equipped with the financial knowledge and asset management skills provided by digital technologies. As a result, to achieve higher returns, these investors are more likely to further increase their allocation of risky financial assets.

5.3 Heterogeneity Analysis

Given the differences in household asset levels and regional location, it is necessary to further examine whether digital literacy affects households' allocation of risky assets differently. To address this, the study divides the sample based on household asset levels (low, medium, high) and regional location, conducting a heterogeneity analysis of how digital literacy influences Household Asset Allocation toward Financial Risk.

As shown in **Table 4.**, the coefficients for risky asset allocation are positive and significant across the low, medium, and high asset groups. In terms of financial market participation, digital literacy has the greatest impact on households with high asset levels, followed by medium-asset households, and the smallest effect on low-asset households. A possible explanation is that wealthier households, with their stronger risk tolerance, benefit more from increased digital literacy, which enhances their participation in financial markets. Regarding the depth of risky asset investment, digital literacy has the largest impact on low-asset households. This may be because high-asset households are already more heavily invested in risky assets, so the marginal effect of improved digital literacy on increasing their investment depth is smaller compared to low-asset households.

Table 3. Baseline Regression Results of Digital Literacy on Household Risky Financial Asset Allocation

Variable	(1)	(2)	(3)	(4)
	Probit	Probit	Tobit	Tobit
digital_literacy	0.1733*** (0.0050)	0.0961*** (0.0070)	0.1815*** (0.0062)	0.1194*** (0.0101)
gender		-0.0003 (0.0026)		0.0238*** (0.0034)
age		0.0008*** (0.0001)		-0.0006*** (0.0002)
marriage		-0.0003 (0.0040)		-0.0077 (0.0050)

education		0.0085***		-0.0006
		(0.0019)		(0.0032)
health		0.0014		0.0093***
		(0.0012)		(0.0014)
family_scale		-0.0087***		-0.0185***
		(0.0011)		(0.0010)
lnfamily_wealth		0.0200***		-0.0470***
		(0.0014)		(0.0015)
lnincome		0.0182***		0.0624***
		(0.0019)		(0.0022)
selfempoly		-0.0160***		-0.0131**
		(0.0042)		(0.0056)
house		0.0086**		0.0029
		(0.0038)		(0.0053)
urban		0.0321***		0.0228***
		(0.0037)		(0.0037)
lngdp		0.0140***		0.0437***
		(0.0034)		(0.0046)
pseudo R^2	0.1611	0.3545	0.0751	0.2673
N	31630	26165	30261	26165

Note * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As shown in **Table 5.**, the impact of digital literacy on risky asset allocation is positive and significant across households in the eastern, central, and western regions. In terms of financial market participation, digital literacy has the greatest impact on eastern households, followed by central households, with western households seeing the smallest effect. However, when it comes to the depth of risky asset investment, the central region

sees the greatest impact, followed by the western region, with the eastern region seeing the smallest effect. This may be because the level of digital economic development and infrastructure in the central region falls between that of the eastern and western regions, meaning the effect of digital literacy on financial market participation is moderate, but its impact on investment depth is the highest. Hypothesis 2 is thus confirmed.

Table 4. Heterogeneity Test Results by Household Asset Levels

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Probit	Probit	Probit	Tobit	Tobit	Tobit
	low	middle	high	low	middle	high
digital literacy	0.0216***	0.0535***	0.1615***	0.1818***	0.1006***	0.0722***
	(0.0049)	(0.0085)	(0.0152)	(0.0223)	(0.0133)	(0.0085)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
N	9773	7513	8829	9774	7514	8834
pseudo R^2	0.3377	0.2568	0.2239	0.1771	0.7218	0.3030

Table 5. Results of the Test of Heterogeneity of Households in Different Regions

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Probit East	Probit Central	Probit West	Tobit East	Tobit Central	Tobit West
digital literacy	0.1239***	0.0835***	0.0499***	0.1050***	0.1401***	0.1215***
	(0.0122)	(0.0127)	(0.0087)	(0.0148)	(0.0195)	(0.0189)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
N	11878	6304	7184	11878	6304	7184
pseudo R^2	0.3293	0.3625	0.3327	0.2709	0.2703	0.2395

6. Conclusion

In conclusion, this paper employs the Entropy-TOPSIS method and uses data from

CFPS to measure residents' digital literacy, conducting an empirical analysis on the impact of digital literacy on Household Asset Allocation toward Financial Risk. Enhancing

digital literacy significantly increases the probability of household participation in risky financial markets and intensifies their investments in riskier assets.

The effects of digital literacy vary by household asset levels and regional differences: its impact on market participation decreases progressively from high-asset households to low-asset households, while its impact on investment depth increases accordingly. Regionally, the effect of digital literacy on market participation decreases from eastern to central to western regions, but for investment depth, the central region sees the highest impact, followed by the western and eastern regions.

To better leverage digital literacy in optimizing households' allocation of financial risk assets, this paper offers the following recommendations: First, a comprehensive digital literacy cultivation system should be developed to enhance residents' digital literacy. The government should take the lead, while industry associations and enterprises should also play a role in building a well-rounded digital literacy framework. Families should proactively take steps to improve their own digital capabilities. By combining individual initiative with government-led digital education efforts, digital literacy can be improved more effectively, which in turn enhances the efficiency of allocating risk financial asset portfolios. Second, the convenience of the digital economy should be fully utilized to expand online investment channels for financial products. Financial institutions should respond to market demand, accelerate financial innovation, and proactively customize a variety of financial products tailored to families of different age groups, regions, and income levels. Financial institutions need to continuously innovate, while enhancing customer engagement, to better meet households' needs for risk asset allocation. Third, digital infrastructure in the central and western regions should be strengthened to promote balanced and coordinated regional development. The disparity in digital literacy across regions stems from significant gaps in digital infrastructure development. The government needs to swiftly advance the construction of digital resource infrastructure to improve

residents' digital literacy, thereby promoting broader and deeper development of risk financial markets.

Acknowledgments

This study was supported by Jiangxi Social Science Fund No. 20YJ12 and Jiangxi Graduate Education Reform Fund No. JXYJG-2022-051.

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