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Article

Household risky financial asset allocation in China: The influence of financial literacy dimensions

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Abstract: The rise of financial inclusion has notably increased household engagement in risky financial asset allocation, posing challenges to macro-financial stability. This study explored the crucial role of financial literacy in enabling households to effectively engage with complex financial markets and products. Specifically, it examined how different aspects of financial literacy—knowledge, attitudes, and skills—influence both the participation and depth of household investment in risky financial assets in China. Utilizing a comprehensive dataset from the 2019 China Household Finance Survey, which included 32,458 households, this study employed a robust indicator system and regression analysis via STATA 17.0 to assess these impacts. The results demonstrated that enhancements in financial literacy significantly foster increased engagement and deeper involvement in risky asset allocation, particularly through improved financial attitudes. Additionally, the analysis revealed that households led by women show a higher propensity towards risky asset investments than those led by men. These insights suggested the potential for targeted financial education to improve the financial health and economic resilience of Chinese households.

Keywords: financial literacy; financial knowledge; financial attitudes; financial skills; risky financial asset allocation; gender

1. Introduction

Over the 21st century, China's economy has experienced significant advancements, which has led to its total Gross Domestic Product (GDP) ranking as the second largest globally (Nye, 2020). Chinese households are increasingly focusing on their financial asset portfolios and risk management, as their household wealth grows rapidly (Hu et al., 2020; Li and Zhang, 2021). Financial inclusion has expanded the options available for Chinese households to allocate their financial assets, enhancing investment efficiency (Lu et al., 2023; Zhang, 2024). Risky financial asset allocation is the key topic in household finance and classical portfolio theory and typically includes stocks, bonds, funds, wealth management, derivatives, gold, and foreign exchange, all of which can be exchanged on formal financial markets. Investors can mitigate unsystematic financial risks in their portfolios by diversifying their investments, thereby decreasing portfolio risk and enhancing investment efficiency (Bikeri, 2022; Mazumdar et al., 2020). Nevertheless, the financial asset allocation of Chinese households is characterized by singularity, robustness, and conservatism. Most households primarily invest and manage their finances through bank deposits, insurance, and real estate, which continue to represent a significant portion of traditional assets. Conversely, the proportion of financial assets like stocks and funds held by households is relatively low (Lu et al.,

2020; Lu et al., 2021).

Households' investment in risky financial assets is directly influenced by their level of financial literacy. Guiso and Sodini (2013) demonstrated that the degree of financial literacy and risk preference had a substantial influence on the asset selections made by households. Yin's (2014) study provides additional evidence supporting the direct association between the financial literacy level of the household's head and the household's engagement in the financial market. Furthermore, investors' level of financial knowledge, analyses of financial markets, and proficiency in the use of financial products contribute to the diversification of their financial portfolios and improve their investment portfolios (Abreu and Mendes, 2010; Bazley et al., 2021). Improving financial literacy can improve portfolio returns while controlling portfolio risk (Bianchi, 2018). Households that possess a higher degree of financial literacy are more motivated to engage in financial markets, exhibit a greater likelihood of implementing rational investment strategies, allocate a substantial portion of their total household assets to financial assets, and experience higher returns when investing in financially risky assets (Gaudecker, 2015; Jiang et al., 2020).

Previous research has not extensively examined the influence of various aspects of financial literacy (such as financial knowledge, financial attitudes, and financial skills) on household risky financial asset allocation. This study significantly enhances the literature on household risky financial asset allocation by developing indicators for various aspects of financial literacy and employing causal regression to examine the influence of financial knowledge, attitudes, and skills on the participation and depth of household risky financial asset allocation, respectively. Furthermore, the study sheds light on the significance of allocating risky financial assets to households, which is especially pertinent as policymakers have become more concerned with this issue in recent years. Several developing countries have been implementing financial system reforms and expanding their offerings of financial services and products. Additional empirical research is necessary in developing countries. We select China as a case study due to its status as the largest developing country globally. The rapid rise of Chinese financial market is one of the best examples of what is happening in many developing countries around the world. This paper provides a scientific and theoretical foundation for policymakers in developing countries to formulate comprehensive investment plans and policies for financial assets from the perspective of financial literacy.

2. Literature review

There are numerous factors influencing the household risky financial asset allocation, which is one of the main focuses of research on household finance. Several studies have examined the factors influencing household asset investment behavior, which can be roughly categorized into external and internal household factors.

Household external factors primarily encompass financial constraints, market dynamics, and other related factors. Financial constraints negatively affect the proportion of households investing in risky assets and can increase the cost of

household participation in the risky asset market, which in turn leads to a lower willingness of households to invest in risky assets (Roche, 2013). Khorunzhina (2013) provides more evidence supporting this perspective since her research demonstrates that the expense of participation reduces consumers' willingness to invest in risky assets. High investment costs negatively impact both domestic and foreign investments of households (Christelis and Georgerakos, 2013; Li et al., 2020). In addition, when there is uncertainty in the market, households' willingness to invest in risky markets may decrease (Antoniou et al., 2015; Zhang et al., 2021). Bilias et al. (2017) have a different view, arguing that instability in the economic environment does not affect the depth of residents' investment in equity assets.

Household internal factors play a significant role in determining household investment in risky assets. Regarding household demographics, women exhibit a lower propensity to invest in high-risk assets and display a greater aversion to risk. Men tend to be more inclined to participate in risky stock markets than women's more conservative risk appetite (Badunenko et al., 2009; Epaphra and Kiwia, 2021; Nadeem et al., 2020), furthermore, married households have a greater risk-tolerance and thus a greater likelihood of choosing to hold financial risky assets, with a higher risk-asset investment return are higher (Agnew and Annika, 2003; Bucciol et al., 2017). Numerous studies have shown that risk exposure of households affects investment in risky financial assets. According to Gollier (2001), households' equity investments are displaced by risks related to household health and income. Cardak et al. (2009) highlight that the health status of individuals has an impact on the asset decisions made by households. Specifically, households with poorer health tend to hold a smaller proportion of financial assets.

Bressan et al. (2014) contend that household asset portfolio is influenced by residents' subjective health evaluations and are not affected by objective reality. Furthermore, Calvet and Sodini (2014) contend that a higher level of household income also plays a key role in encouraging household involvement in financial markets. Nevertheless, fluctuations in income might also restrict the extent to which households can invest in high-risk assets. Bucciol and Miniaci (2015) contend that households are limited in the amount of risk they can take and that having a large amount of wealth increases the risk coefficient of the household, which in turn also limits the household's ability to invest in risky assets. Zhou et al. (2017) discovered that housing assets crowd out households' risky asset investments. They also observed that as the value of housing assets increases, the proportion of equity assets held by households decreases. Munk (2020) further validates this finding, stating that the decision to purchase a house and the decision to invest in risky assets are mutually exclusive options and that there is a "crowding out effect" between them, especially for younger households. This is particularly the case for younger households. In contrast, households in Australia who own homes are more inclined to engage in the stock market, leading to a higher accumulation of financial assets. This can be attributed to the accessibility of affordable loans for housing inside the country (Cardak and Wilkins, 2009).

Measuring the effectiveness of household risky financial asset allocation and suggesting optimization is another focus of household financial asset allocation research. According to classical portfolio theory, investors should allocate a specific

portion of their money to risky financial assets to maximize utility, as long as there is a risk premium. Gaudecker (2015) found that the lower the level of financial literacy, the lower the investment return for households. The findings suggest that households should enhance their financial management skills or consider hiring a professional financial manager to get satisfactory investment returns. Blanchett and Straehl (2015) examined the portfolio optimization problem using modeling techniques. They discovered that the best ratio of stock investments is inversely related to the age of the household head and directly related to income. Income is subject to both good and negative consequences. Villasanti and Passino (2017) propose the employment of control feedbackers as investment advisors to assist low-income individuals in making investment decisions about household asset allocation. Brunetti et al. (2016) take Italian households as the object of their study and argue that households should develop a reasonable portfolio of assets to guard against unexpected expenditures arising from the risks.

In response to the demands of socio-economic progress and the enhancement of the financial market, researchers have conducted studies on financial literacy and household risky financial asset allocation. Prior research has primarily examined the correlation between financial literacy and the diversification and effectiveness of household portfolios. However, there has been limited investigation into the influence of financial literacy on the allocation of risky financial assets within households. Furthermore, there is a scarcity of literature that integrates various dimensions of financial literacy, such as financial knowledge, attitudes, and skills. This study utilizes data from the 2019 questionnaire that was publicly disclosed on 31 December 2021, by the China Household Finance Survey and Research Centre of the Southwestern University of Finance and Economics. The objective of this study is to examine the correlation between different dimensions of financial literacy and the participation and depth of household risky financial asset allocation. Descriptive statistical analyses and empirical analytical models are employed to uncover the underlying mechanisms.

3. Hypotheses formulation

Financial literacy plays a crucial role in shaping customers' financial decisions (Lusardi, 2008, 2011a, 2011b, 2013, 2015). The richness of financial literacy reserves directly affects households' participation in financial markets, as well as their choice of holding risky assets (Yin et al., 2014). Hung et al. (2009) constructed a financial literacy model comprising four dimensions: financial knowledge, financial skills, perceived knowledge, and financial behaviors. The link between these variables is defined as financial literacy. The definition aligns with the perspectives of Khan et al. (2021), Lusardi and Mitchell (2013), Xiao et al. (2014), who suggest that financial literacy encompasses an individual's knowledge, abilities, and attitudes that shape their financial conduct. According to prior research, we contend that financial literacy encompasses three crucial dimensions: financial knowledge, financial attitudes, and financial skills.

According to Arifin (2017), individuals who possess financial knowledge are more likely to demonstrate positive financial behavior, such as exercising financial

control, making timely bill payments, engaging in financial planning, meeting their financial needs, and saving for insurance. Aminatuzzahra (2014) in his research states that financial knowledge has an impact on investing decision-making. The study conducted by Herdjiono and Damanik (2016) demonstrates that an individual's financial attitude plays a crucial role in shaping their approach to controlling different financial behaviors. Having a positive financial attitude enhances decision-making in financial management. Furthermore, the acquisition of financial skills enables households or individuals to efficiently allocate and manage financial assets (Hung et al., 2009). Nevertheless, there has been no research conducted on the subject of risky financial asset allocation using the three dimensions of financial literacy (financial knowledge, financial attitudes, and financial skills) in a comprehensive and focused manner. Thus, this study commences by proposing the following hypotheses to empirically examine the impact of the three aspects of financial literacy on households participating in risky financial asset allocation. So, the paper presents the following research hypothesis:

H1: Financial knowledge is positively associated with household participation in risky financial asset allocation.

H2: Financial attitudes are positively associated with household participation in risky financial asset allocation.

H3: Financial skills are positively associated with household participation in risky financial asset allocation.

The rise in financial literacy is seen not only in its substantial impact on the probability of households participating in financial markets but also in the growth of high-risk household assets as a proportion of total household assets (Jappelli et al., 2013). Von Gaudecker (2015) discovered that individuals with greater financial literacy tend to seek guidance from specialists to attain satisfactory investment returns. Compared to these groups, households with below-median financial literacy and trust in their decision-making abilities are expected to lose an average of 50 basis points. Calvet et al. (2009) developed a financial sophistication index by analyzing data from Swedish households. They discovered a strong and positive correlation between the financial sophistication index and the proportion of risky assets owned by households. Consequently, this study puts forth the subsequent research hypothesis:

H4: Financial knowledge is positively associated with the depth of household risky financial asset allocation.

H5: Financial attitudes are positively associated with the depth of household risky financial asset allocation.

H6: Financial skills are positively associated with the depth of household risky financial asset allocation.

4. Methods

4.1. Data

To examine these hypotheses, this study utilizes data from the China Household Finance Survey (CHFS, 2019), which covers 29 provinces (including autonomous regions and municipalities directly under the central government), 343 districts and

counties, and 1360 villages (or neighborhood) committees across China. This paper uses STATA 17.0 for statistical and empirical analyses. It gathers data from 34,643 sample households, excluding incomplete information and extreme samples. The final number of sample observations is 32,458 households while ensuring data credibility.

4.2. Variables

4.2.1. Dependent variables

This research focuses on measuring household risky financial asset allocation (RFAA) by selecting two dependent variables: the participation of household risky financial asset allocation (ifrisk) and the depth of allocation (riskratio). The CHFS (2019) questionnaire categorizes risky financial assets into seven types: stocks, bonds, funds, wealth management, derivatives, gold, and non-RMB assets. Regarding the participation of RFAA, if a household holds any of the aforementioned risky financial assets, it is assigned a value of 1; otherwise, it is assigned a value of 0. The depth of RFAA is identified by calculating the ratio of household risky financial assets to total household financial assets, which includes cash, demand deposits, time deposits, and risky financial assets. A higher ratio indicates more allocation of risky financial assets by the household in the sample.

4.2.2. Independent variables

The variables examined in this paper are the several dimensions of financial literacy, namely financial knowledge (FK), financial attitudes (FA), and financial skills (FS). CHFS (2019) set up the survey to test the financial literacy dimensions by asking questions on conceptual knowledge, numerical competence, financial attitudes, and skills related to households' daily financial decision-making to provide a comprehensive and intuitive understanding of the financial situation of different households. Financial knowledge is an essential aspect of financial literacy and indicates the level of understanding that households have in managing their finances. This study follows the method used by Zhang and Yin (2016) to measure the financial knowledge of households. The measurement is based on three items related to interest rates and inflation, which are included in the financial literacy portion of the CHFS (2019). Financial attitudes reflect households' overall concern and risk awareness of the financial sector. The study examines households' financial attitudes based on four questions in CHFS (2019) about their level of attention to financial information, knowledge of financial products, risk appetite for financial investment, and tendency to invest in financial products. This study employs min-max normalization to change the scores of the four questions evaluating financial attitudes. The normalization process ensures that each question score is mapped between the range of 0 and 1. Financial skills refer to the practical capacity of households to obtain and utilize financial knowledge. This study determines the financial skills of the respondent households through four questions in CHFS (2019), such as whether they can make a profit by investing in various financial products. If there is a profit, it is assigned a value of 1, while the others are assigned a value of 0. This study utilized Chen's (2020) score-summing approach to estimate the individual scores of financial knowledge (FK), financial attitudes (FA), and financial skills

(FS). The purpose was to gain a comprehensive understanding of the financial literacy dimensions as independent variables.

4.2.3. Control variables

This study incorporates control variables that encompass both head characteristics and household economic characteristics to examine the influence of numerous factors on household hazardous financial asset allocation. It not only mitigates the adverse effects of omitted variables on result analysis, but also enables a more thorough examination of the problem. Regarding the characteristics of the household head, the rationale for including the age, gender, and employment characteristics of the household head is that in Chinese society, the household head usually determines the financial decisions of the household. Their characteristics can significantly affect the household's approach to financial risk-taking, investment decisions, and overall financial management. For example, employment status may influence income stability and thus household risky financial asset allocation behavior. Using these factors as control variables allows the study to explain the variability in financial behavior that can be directly attributed to the personal characteristics of household heads. In terms of household economic characteristics, income and assets are necessary to understand household financial dynamics. In the Chinese household context, where household relationships and joint decision-making are prevalent, collective household characteristics play a crucial role in resource allocation and can significantly influence financial outcomes.

4.3. Descriptive statistics

Descriptive statistics were analyzed for the variables and the results were presented in **Table 1**.

Table 1. Descriptive statistics summary (CHFS, 2019).

Variables	Obs	Mean	SD	Min	Max
Dependent variables					
ifrisk	32,458	0.086	0.280	0.000	1.000
riskratio	32,458	0.028	0.118	0.000	1.000
Independent variables					
FK	32,458	0.733	0.945	0.000	3.000
FA	32,458	0.637	0.640	0.000	4.000
FS	32,458	3.017	0.279	0.000	4.000
Contral variables					
Age	32,458	56.071	13.693	17.000	101.000
Gender	32,458	0.754	0.431	0.000	1.000
Employment	32,458	0.655	0.475	0.000	1.000
Income	32,458	10.619	1.514	0.000	16.311
Assets	32,458	12.805	1.693	2.398	21.465

Notes: Obs for observations, SD for standard deviation, Min for minimum, Max for maximum.

The descriptive statistics reveal that only 8.6 percent of the sampled households have allocated their assets to risky financial investments. This suggests that the

majority of households surveyed have a tendency to avoid participating in risky financial markets, instead opting for safer options such as cash, bank deposits, and property. The standard deviation of the participation of risky financial asset allocation among sample households is 0.280, indicating an imbalance in their allocation. The depth of risky financial asset allocation among the sample households ranges from 0 to 1, with a mean value of 0.028 and a standard deviation of 0.118. This indicates that the level of risky financial asset allocation among the sample households is relatively low. Although 8.6 percent of the households have allocated risky financial assets, the investment amount for this group is relatively small, and there is a lack of diversification in their investment products. The financial knowledge samples have a mean value of 0.733 and a standard deviation of 0.945. This suggests that the level of financial knowledge among the sample households is generally low and reflects significant variance. The financial attitude samples had a mean value of 0.637 and a standard deviation of 0.640. This suggests that most households in the sample have low levels of financial concern and conservative attitudes towards investment risks. The financial skills samples have a mean value of 3.017 and a standard deviation of 0.279. This indicates that the sample households have effective financial management techniques and are successful in their investments.

Chinese households exhibit a low inclination to engage in the risky financial market, with a majority displaying clear risk aversion. Additionally, the overall level of financial literacy among these households is generally poor. Many households have both low total holdings and an illogical structure when it comes to their choice of financial assets. Among the financial assets held by households, risk-free financial assets such as long-term and short-term bank deposits and cash are the main ones, they are very keen on properties, and their allocation of risky financial assets is quite limited. This also indicates that the general financial literacy of Chinese households is relatively low. They typically have limited knowledge about financial matters, lack an understanding of trading mechanisms and market rules, and struggle to employ effective financial strategies to enhance and protect their assets.

Analysis of the household head characteristics in the sample households revealed that the age of the oldest head of household was 101 years, while the youngest was 17 years. The average age of the household heads was 56.071, with a standard deviation of 13.693, indicating that they tend to be relatively older. Of the sample households, around 75.4 percent are headed by males. In addition, 65.5 percent of the household heads were employed. Based on the household economic characteristics, the sample household income has a maximum value of 16.311, a minimum value of 0, a mean of 10.619, and a standard deviation of 1.514. This suggests that the total annual income of the sample households is at a medium-upper level. Additionally, the sample households' total assets have a maximum value of 21.465, a minimum value of 0, a mean of 12.805, and a standard deviation of 1.693. This indicates that the sample households have a medium to high level of total assets. Furthermore, it shows that as household income increases, households also accumulate various assets.

4.4. Measures

This study investigates the potential impact of financial knowledge (FK), financial attitudes (FA), and financial skills (FS) on two aspects of household risky financial asset allocation: the participation and the depth of RFAA.

For empirical analysis, this study builds a Binary Probit model regarding Abreu and Mendes (2010), Yin et al. (2014), taking into account that participation of RFAA is a discrete variable, which takes the value of either 0 or 1, and that there is no truncation of the data. The Binary Probit model can be used to assess the marginal utility of the three dimensions of financial literacy for household participation in RFAA.

The depth of RFAA refers to the percentage of risky financial assets in the overall financial assets of the household. The higher percentage indicates a greater allocation of risky financial assets. The percentage of risky financial asset allocation takes values between 0 and 1. This study utilizes the ordinary least squares (OLS) regression model to investigate the correlation between financial knowledge (FK), financial attitudes (FA), financial skills (FS), and the depth of household risky financial asset allocation.

5. Empirical results

5.1. Pearson correlation

To initially understand and assess the relationship between the variables, this study used Pearson correlation analysis to measure the strength and direction of the linear relationship between the variables.

Table 2. Pearson correlation coefficient matrix.

	ifrisk	**riskratio**	**FK**	**FA**	**FS**	**Age**	**Gender**	**Employment**	**Income**	**Assets**
ifrisk	1									
riskratio	0.773***	1								
FK	0.294***	0.218***	1							
FA	0.643***	0.520***	0.473***	1						
FS	0.148***	0.089***	0.111***	0.137***	1					
Age	−0.047***	0.013**	−0.208***	−0.223***	0.005	1				
Gender	−0.065***	−0.061***	−0.022***	−0.031***	−0.011**	−0.036***	1			
Employment	−0.050***	−0.086***	0.026***	0.046***	−0.024***	−0.491***	0.246***	1		
Income	0.227***	0.168***	0.277***	0.314***	0.073***	−0.176***	−0.006	0.074***	1	
Assets	0.308***	0.239***	0.324***	0.386***	0.109***	−0.168***	−0.022***	−0.014**	0.460***	1

Notes: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

The data shown in **Table 2** demonstrates a significant relationship between the variables. There is a significant and beneficial connection between financial knowledge, attitudes, and skills with the level of participation and depth of RFAA ($p < 0.01$). The correlation coefficients for all other variables indicates their plausibility. For instance, the participation and depth of RFAA are diminished for households whose heads are older, male, and employed, whereas the participation and depth of

RFAA are amplified for households with higher yearly income and greater total assets. Based on the aforementioned studies, it is evident that the selection of research variables is appropriate.

5.2. Basic regression

This study employed regression analyses, specifically the Binary Probit model and the ordinary least squares (OLS) regression model, to establish a stronger connection between the financial literacy dimensions such as financial knowledge, attitudes, and skills, and the participation and depth of household risky financial asset allocation.

5.2.1. FK, FA, FS, and participation of RFAA

Table 3 displays the Binary Probit model regressions for financial knowledge (FK), financial attitudes (FA), financial skills (FS), and participation in household risky financial asset allocation (ifrisk), while accounting for population and household characteristics factors.

Table 3. The impact of FK, FA, and FS on participation of RFAA.

Variables	**Participation of RFAA**		
	(1)	**(2)**	**(3)**
FK	0.337***		
	(28.912)		
FA		1.652***	
		(55.374)	
FS			0.228***
			(5.430)
Age	0.000	0.012***	−0.005***
	(0.260)	(8.473)	(−4.662)
Gender	−0.177***	−0.213***	−0.169***
	(−6.560)	(−6.088)	(−6.403)
Employment	−0.211***	−0.212***	−0.243***
	(−6.789)	(−5.148)	(−8.147)
In_income	0.181***	0.068***	0.217***
	(11.984)	(4.521)	(14.057)
In_asset	0.363***	0.218***	0.398***
	(27.894)	(14.748)	(30.439)
_cons	−8.451***	−7.259***	−9.359***
	(−41.613)	(−31.766)	(−40.837)
N	32,458	32,458	32,458
R^2	0.2782	0.5853	0.2385

Note: *t* statistics in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% statistical levels, respectively.

Table 3 demonstrates a significant positive association between FK and the participation of RFAA at the 1 percent statistical level, with the participation of RFAA increasing by 33.7 percent when FK increases by one unit. This confirms the

H1. Households with higher levels of FK are more inclined to participate in risky financial asset allocations, such as investing in stocks, funds, and financial products. This may be because households with higher FK can take a more rational view of the risks and returns of investment, are well aware of and understand the significance of an efficient portfolio of investment assets for the household, and then actively participate in risky financial assets to obtain Pareto-optimality in their investment activities.

There is a significant positive relationship between FA and the participation of RFAA at the 1 percent statistical level. The statistical analysis shows that for every one-unit increase in FA, there is a 165.2 percent increase in household participation in RFAA. This confirms H2. The finding indicates that having positive financial attitudes plays a crucial role in encouraging households to participate in risky financial asset allocation. which in turn, enhances households' capacity to handle risk, increases their willingness to take risks, and fosters a stronger inclination towards investing in risky financial assets.

There is a significant and beneficial connection between FS and the participation of RFAA. This relationship is statistically significant at the 1 percent level, indicating a 22.8 percent increase in the participation of RFAA for every unit increase in FS. This finding confirms H3. These findings indicate that households with excellent financial skills are more likely to have the confidence and motivation to engage in risky financial markets.

From the control variables selected for this study, the variables that are significantly positively correlated are total household income and total household assets. Total household income and total household assets show a positive correlation with the participation of RFAA at the 1 percent statistical level, the result that is consistent with the findings of Calvet and Sodini (2014), which concluded that as total income and assets increase, households become more likely to engage in risky financial investments. This may be due to the fact that, on the one hand, when households' total income and total assets are higher, they are more open to accepting losses due to participation in risky asset investments, and on the other hand, higher incomes and larger total assets owned by households also imply that they have more spare funds and wealth to allocate to asset allocation, and thus higher-income and higher-asset households are more inclined to make decisions about participation in risky financial asset investments.

The variables that are significantly negatively correlated in the control variables section are the gender of the household head and employment status. This implies that households with male heads are less likely to engage in RFAA relative to households with female heads, a result that is inconsistent with the results of some scholars, Deo and Sundar (2016) argued that males are more likely to engage in risky asset investment than females, with males being more risk-seeking and females being more risk-averse. An explanation for this phenomenon may be found in a research report conducted by the Chinese Academy of Financial Inclusion (CAFI) in 2021. The report reveals that 63% of households in China are managed by women in terms of financial matters. Another possible explanation is perhaps because after getting married, women believe that their own lives are secured, and to obtain a stronger sense of security, they are thus more willing to engage in risky financial

asset allocations. However, these are only possible conjectures, and the real reasons behind them have yet to be explored in depth. In addition, heads of households with employment have a lower probability of investing in risky financial assets compared to heads of households without employment, which may since heads of households with employment rely on their salary income to ensure the basic livelihood and level of well-being of their households, and are reluctant to invest in financial products with risk factors.

5.2.2. FK, FA, FS, and depth of RFAA

Table 4 shows the ordinary least squares (OLS) regression model results for financial knowledge (FK), financial attitudes (FA), financial skills (FS), and the depth of RFAA (riskratio) after controlling for population and household characteristics variables.

Table 4. The impact of FK, FA, FS on depth of RFAA.

Variable	**Depth of RFAA**		
	(1)	**(2)**	**(3)**
	riskratio	**riskratio**	**riskratio**
FK	0.019***		
	(20.708)		
FA		0.096***	
		(50.916)	
FS			0.021***
			(3.794)
Age	0.000***	0.001***	0.000**
	(6.890)	(17.597)	(2.342)
Gender	−0.009***	−0.007***	−0.009***
	(−5.463)	(−4.925)	(−5.342)
Employment	−0.010***	−0.009***	−0.012***
	(−7.039)	(−6.978)	(−8.363)
In_income	0.004***	−0.000	0.006***
	(9.564)	(−0.778)	(12.979)
In_asset	0.010***	0.002***	0.011***
	(22.960)	(5.824)	(26.552)
_cons	−0.101***	−0.052***	−0.174***
	(−9.790)	(−5.774)	(−9.019)
Prov	Yes	Yes	Yes
N	32,458	32,458	32,458

Note: *t* statistics in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% statistical levels, respectively.

The data shown in **Table 4** indicates that FK has a significant positive impact on the depth of RFAA at the 1 percent statistical level. For every unit increase in FK, there is a 1.9 percent increase in the depth of RFAA, which confirms H4. Findings shows households with greater FK are more likely to invest in risky financial assets,

and also the share of risky assets in the total financial assets of the household will become higher. This may be since households with higher levels of FK are better able to identify the risk and return profiles of investment activities and are more likely to profit from risky investments, thus increasing the depth of RFAA.

There is a significant beneficial connection between FA and the depth of RFAA at the 1 percent statistical level, with each unit increase in FA increasing the depth of RFAA by 9.6 percent, confirming H5. This suggests that households that are more actively focused on the financial sector and have a high level of risk tolerance are more willing to increase their allocation to risky financial assets.

The study found a significant and beneficial connection between FS and the depth of RFAA at the 1 percent statistical level, with a 2.1 percent increase in the depth of RFAA for each unit increase in FS, confirming H6. This suggests that the higher the level of household financial skills and the more experience in financial investment they have accumulated, the more confident the household will be in rationally allocating risky financial assets and deepening their investment efforts.

In the control variables section, there is a positive link between the age of the household head, total household income, and total household assets with the depth of household risky financial asset allocation at the 1 percent statistical level. This could be attributed to the fact that as the head of the household ages, their financial investment expertise expands, leading to a more objective understanding of the risks and returns of financial products. Consequently, they progressively intensify their investment in risky assets to achieve pareto-optimality in their investment endeavors. Households with higher total incomes and assets prioritize the appreciation and preservation of their household assets. They typically enhance their investment capabilities through learning or delegating the management of their assets to professional organizations to convert more household assets into financial assets.

In the control variables section, the gender of the household head and employment status exhibit a significant negative relationship. Gender has a significant negative impact on the depth of RFAA. This finding contradicts the conclusions of certain scholars, as discussed in the previous section. In China, the majority of household assets are controlled by women, resulting in women dominating household financial decision-making. Consequently, women are more inclined to make risky financial asset allocations and invest more heavily than men. Furthermore, heads of households who are working have a lower propensity to invest in risky financial assets and display a reduced willingness to invest in financial products that possess risk features, as compared to heads of households who are not employed.

5.3. Endogeneity test

There may be a two-way causal relationship between the financial literacy dimensions and household risky financial asset allocation. Firstly, households do not necessarily have or understand certain financial knowledge and high financial literacy before participating in the financial market to invest in risky financial assets, while participating, they can understand and learn the trading rules and financial knowledge to improve financial literacy; secondly, households' participation in the

financial market and allocation of risky financial assets may be affected by many external factors, and these factors are difficult or even impossible to be effectively observed. Therefore, this study adopts an instrumental variable approach to address the endogeneity issue, considering the available information from existing data and referring to Ellis et al. (2017), the average financial knowledge (mean_fk), average financial attitudes (mean_fa), and average financial skills (mean_fs) of households in the same province other than their own are selected as instrumental variables.

Table 5. FK, FA, FS on participation of RFAA (2SLS estimation results).

Variable	**First-stage regression**			**Second-stage regression**		
	FK	**FA**	**FS**	**ifrisk**	**ifrisk**	**ifrisk**
mean_fk	0.461***					
	(6.990)					
FK				0.616**		
				(2.015)		
mean_fa		0.393***				
		(6.219)				
FA					0.945**	
					(2.015)	
mean_fs			0.801***			
			(9.385)			
FS						1.132**
						(2.015)
Age	−0.013***	−0.008***	0.000**	0.002	0.002	−0.006***
	(−29.904)	(−28.688)	(1.986)	(0.580)	(0.479)	(−5.550)
Gender	0.005	−0.020**	−0.000	−0.159***	−0.138***	−0.156***
	(0.415)	(−2.446)	(−0.074)	(−5.936)	(−4.883)	(−5.823)
Employment	−0.114***	−0.036***	−0.003	−0.146***	−0.182***	−0.213***
	(−9.562)	(−4.656)	(−0.807)	(−3.186)	(−5.291)	(−7.033)
In_income	0.084***	0.061***	0.004***	0.161***	0.155***	0.208***
	(24.106)	(26.433)	(4.411)	(5.455)	(4.804)	(13.271)
In_asset	0.116***	0.101***	0.012***	0.316***	0.292***	0.374***
	(35.951)	(46.139)	(12.310)	(7.512)	(5.470)	(21.127)
Prov	Yes	Yes	Yes	Yes	Yes	Yes
N	32,458	32,458	32,458	32,458	32,458	32,458
F	206.452	204.266	13.074			

Note: *t* statistics in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% statistical levels, respectively.

Table 5 shows the regression results of financial knowledge, financial attitudes, and financial skills on household risky financial asset allocation participation obtained by estimation using two-stage least squares (2SLS) estimation after using instrumental variables. In the first stage regression, the *F*-values are 206.452, 204.266, and 13.074, respectively, which are all greater than the critical value of 10, indicating that there is no weak instrumental variable problem, and the selected

instrumental variables are appropriate. From the results of the second stage regression, the financial literacy dimensions have a facilitating effect on the participation in the financial allocation of risky assets, which further indicates that the previous regression results are robust.

Table 6. FK, FA, FS on depth of RFAA (2SLS estimation results).

Variable	**First-stage regression**			**Second-stage regression**		
	FK	**FA**	**FS**	**riskratio**	**riskratio**	**riskratio**
mean_fk	0.461***					
	(6.990)					
FK				0.246***		
				(9.171)		
mean_fa		0.393***				
		(6.219)				
FA					0.378***	
					(9.171)	
mean_fs			0.801***			
			(9.385)			
FS						0.452***
						(9.171)
Age	−0.013***	−0.008***	0.000**	0.003***	0.003***	0.000
	(−29.904)	(−28.688)	(1.986)	(9.405)	(9.414)	(0.229)
Gender	0.005	−0.020**	−0.000	−0.010***	−0.002	−0.009***
	(0.415)	(−2.446)	(−0.074)	(−6.022)	(−0.977)	(−5.265)
Employment	−0.114***	−0.036***	−0.003	0.016***	0.001	−0.011***
	(−9.562)	(−4.656)	(−0.807)	(4.620)	(0.586)	(−7.469)
In_income	0.084***	0.061***	0.004***	−0.015***	−0.018***	0.004***
	(24.106)	(26.433)	(4.411)	(−6.529)	(−6.820)	(7.625)
In_asset	0.116***	0.101***	0.012***	−0.017***	−0.026***	0.006***
	(35.951)	(46.139)	(12.310)	(−5.296)	(−6.260)	(7.902)
_cons	−1.175***	−1.045***	0.390	0.038	0.128***	−1.441***
	(−15.695)	(−18.627)	(1.520)	(1.545)	(3.746)	(−10.442)
Prov	Yes	Yes	Yes	Yes	Yes	Yes
N	32,458	32,458	32,458	32,458	32,458	32,458
F	206.452	204.266	13.074			

Note: *t* statistics in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% statistical levels, respectively.

Table 6 shows the regression results of financial knowledge, financial attitudes, and financial skills on the depth of household risky financial asset allocation obtained by estimation using two-stage least squares (2SLS) estimation after using instrumental variables. The first-stage *F*-values are 206.452, 204.266, and 13.074, respectively, which are all greater than the critical value of 10, indicating that there is no weak instrumental variable problem, and the selected instrumental variables are appropriate. From the regression results, financial literacy contributes to the depth of

financial allocation to risky assets, further indicating that the previous regression results are robust.

5.4. Robustness tests

To ensure the accuracy of the analyses, we use two ways to conduct robustness tests. The first is to change the regression method, since the depth of household financial participation indicator is 0 in the left data set, the probit and OLS regression is replaced with Logit and Tobit regression, and the robustness regression results are presented in **Table 7**. Secondly, the robustness test is based on different samples, if the head of the household is a financial sector employee, the level of the dimensions of financial literacy of the household may be higher than that of other households, which may lead to biased results of the impact of the dimensions of financial literacy on the allocation of risky financial assets of the household. Therefore, this study excludes the sample of households in which the head of the household is a financial industry practitioner and obtains a sample of 31,784 households, and the robustness regression results are shown in **Table 8**. As can be seen from the regression results, the findings of the robustness test are consistent with the basic regression findings.

Table 7. Robustness test for changing regression methods.

Variable	**Logit**			**Tobit**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	ifrisk	**ifrisk**	**ifrisk**	**riskratio**	**riskratio**	**riskratio**
FK	0.628***			0.020***		
	(28.402)			(27.903)		
FA		3.184***			0.097***	
		(54.581)			(101.097)	
FS			0.603***			0.025***
			(6.012)			(10.984)
Age	0.001	0.022***	−0.008***	0.000***	0.001***	0.000***
	(0.567)	(8.172)	(−4.168)	(9.005)	(20.836)	(4.350)
Gender	−0.320***	−0.407***	−0.297***	−0.011***	−0.008***	−0.011***
	(−6.272)	(−5.973)	(−5.949)	(−7.019)	(−5.982)	(−7.064)
Employment	−0.393***	−0.411***	−0.436***	−0.014***	−0.011***	−0.016***
	(−6.570)	(−5.061)	(−7.638)	(−8.614)	(−8.079)	(−10.099)
In_income	0.349***	0.123***	0.416***	0.005***	0.000	0.006***
	(11.954)	(4.129)	(14.082)	(10.105)	(0.457)	(13.641)
In_asset	0.709***	0.429***	0.769***	0.012***	0.004***	0.014***
	(29.179)	(15.389)	(31.697)	(27.064)	(9.634)	(32.262)
_cons	−16.272***	−13.913***	−18.454***	−0.197***	−0.126***	−0.287***
	(−43.919)	(−31.653)	(−42.581)	(−27.312)	(−19.733)	(−30.020)
Prov	Yes	Yes	Yes	Yes	Yes	Yes
N	32,458	32,458	32,458	32,458	32,458	32,458
R^2	0.2775	0.5854	0.2404			

Note: *t* statistics in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% statistical levels, respectively.

Table 8. Robustness tests for the sample of financial industry practitioners in excluded households.

Variable	Participation of RFAA			Depth of RFAA		
	ifrisk	ifrisk	ifrisk	riskratio	riskratio	riskratio
FK	0.333***			0.018***		
	(27.286)			(19.762)		
FA		1.672***			0.096***	
		(53.648)			(48.911)	
FS			0.206***			0.020***
			(4.692)			(3.441)
Age	−0.000	0.011***	−0.005***	0.000***	0.001***	0.000***
	(−0.199)	(7.572)	(−4.822)	(6.991)	(17.388)	(2.714)
Gender	−0.170***	−0.212***	−0.157***	−0.009***	−0.008***	−0.009***
	(−6.086)	(−5.855)	(−5.754)	(−5.367)	(−5.059)	(−5.225)
Employment	−0.191***	−0.178***	−0.222***	−0.010***	−0.009***	−0.013***
	(−5.976)	(−4.173)	(−7.193)	(−7.240)	(−6.871)	(−8.599)
In_income	0.171***	0.069***	0.204***	0.004***	−0.000	0.005***
	(11.139)	(4.445)	(13.028)	(9.101)	(−0.602)	(12.318)
In_asset	0.340***	0.192***	0.374***	0.009***	0.002***	0.011***
	(23.541)	(11.765)	(25.719)	(22.105)	(5.679)	(25.546)
_cons	−7.786***	−6.631***	−8.601***	−0.094***	−0.051***	−0.163***
	(−32.286)	(−24.511)	(−31.604)	(−9.076)	(−5.671)	(−8.152)
Prov	Yes	Yes	Yes	Yes	Yes	Yes
N	31,784	31,784	31,784	31,784	31,784	31,784
R^2				0.101	0.296	0.085

Note: *t* statistics in parentheses. ***, **, * denote significance at the 1%, 5%, and 10% statistical levels, respectively.

6. Discussion

This study validates a prior study conducted by Zou and Deng (2019) in urban China, which shown that financial literacy has a substantial impact on the level of family engagement in the financial market. Households that possess financial literacy abilities are provided with a greater quantity, higher quality, and more precise information. Therefore, they will progressively engage in the distribution of financial assets, both in terms of quantity and proportion (Tian et al., 2020). García-Pérez-de-Lema et al. (2021) argue that enhancing household financial literacy results in enhanced decision-making abilities, as households gain a deeper comprehension and utilization of information on financial products and services.

Limited empirical research has been conducted in the literature on the effect of financial literacy dimensions on the depth of household risky financial asset allocation. The results of this study are supported by Khan et al. (2021), who argue that financial literacy increases investment in risky assets by increasing awareness, lowering the cost of participation, and improving cognitive ability and that financial literacy is associated with investment in stock portfolios, bonds, and foreign

currency investments, and that lack of financial literacy is one of the reasons for the lack of investment in risky assets in Japan. However, unlike the results of this study, Cupák et al. (2020) use an unconditional quantile regression and find that among households that typically hold a higher share of risky assets, those with financial literacy hold a relatively lower share of risky assets. Thus, financial literacy dampens the risk preferences of households with relatively high-risk tolerance.

The relationship between household total income, total assets, and the participation and depth of households' risky financial asset allocation are all significant. As total income and total assets increase, households are more likely to engage in risky financial investments and they pay more attention to the appreciation and preservation of household assets by converting more household assets into financial assets. In addition, there is a significant relationship between the age of the head of household and the depth of household risky financial asset allocation. This is because as household heads grow older, they accumulate financial investment experience, gain a more objective understanding of the risks and returns of financial products, and gradually increase the depth of investment in risky assets in pursuit of Pareto optimality in their investment activities.

However, the gender and employment status of the head of household are negatively associated with both the participation and depth of household risky financial asset allocation. Households headed by females are more likely to participate in and deepen their risky financial asset allocation than households headed by males, and this finding is inconsistent with previous studies in the literature (Epaphra and Kiwia, 2021; Nadeem et al., 2020). One possible explanation could be the difference in customs between China and Western countries, where most of the property in Chinese households is kept by women (CAFI, 2021), which leads to the fact that household financial decisions are mostly dominated by women. Another possible explanation could be that after marriage, women believe that their lives are secure, and to gain a stronger sense of financial security, they are therefore more willing to engage in risky financial asset allocation and are bolder in investing in risky financial assets. This view is supported by Bertocchi et al. (2018), who based on a dataset from the Bank of Italian Household Income and Wealth Survey (HIWS) for the period 1989–2006, find that married women perceive their marriage as a secure asset, and as a result they are more willing to invest in risky assets. In addition, working heads of households are less willing to invest and deepen their investments in financial products with risk factors based on stable income than those who are unemployed or jobless.

Household risky financial asset allocation is a hot topic in the field of household finance, and many scholars have always been keenly interested in it. Based on collating and summarizing previous relevant studies, this study starts from the perspective of the level of each dimension of financial literacy and argues that the level of financial knowledge, financial attitudes, and financial skills are the important factors affecting household risky financial asset allocation behaviors.

7. Conclusion

The previous financial crisis, along with the ongoing socio-economic crisis

caused by COVID-19, has had a negative impact on the financial situation of households. It is crucial to thoroughly examine the allocation of risky financial assets within households, as well as the reasons and factors that influence their investment in such assets. We found that higher levels of financial literacy promote households' allocation of risky financial assets, in which positive financial attitudes play an important role, with a higher degree of influence than financial knowledge and financial skills. Households with positive financial attitudes have a stronger willingness to invest. When households are faced with sudden risk shocks, they can adopt financing instruments more actively and quickly to cope with the challenges. In addition, households with good financial knowledge and skills are better able to make rational financial decisions and rationally allocate financial assets in the process of accumulating experience, thus enhancing financial returns. We also find that female heads of households are more likely to engage in risky financial asset allocations than male heads of households in China.

It is important to acknowledge that risky financial assets encompass a diverse array of categories, such as stocks, bonds, foreign currency, futures, funds, and so on (Chen et al., 2020). This study has not yet examined the specific categories of risky financial assets, such as stocks or funds, that are influenced by the financial literacy factor in terms of allocation depth. It is widely recognized that the investment risk of stocks is greater than that of funds, and further research is needed to determine which risky financial assets Chinese households can invest more in to achieve greater returns as a result of improved financial literacy.

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