Financial Economics Research; Vol.3, No.2; 2026
E-ISSN: 3006-3663 P-ISSN: 3006-3655
DOI: https://doi.org/10.70267/fer.250302.255269
Published by: Zeus Press

Research on the Impact of Digital Financial Literacy on Household Financial Portfolio Allocation Efficiency

Li Yang[1,2], Chen Yang[1,*]

[1]*Guangxi Normal University, Guilin, Guangxi, China*

[2]*Key Laboratory of Digital Empowerment Economic Development (Guangxi Normal University), Education Department of Guangxi Zhuang Autonomous Region, Guilin, Guangxi, China*

**Corresponding author: Chen Yang.*

Abstract

Against the backdrop of the burgeoning digital economy, this paper investigates the impact of residents' digital financial literacy on the efficiency of household financial asset allocation and its underlying mechanisms. Using micro-survey data from the China Household Finance Survey (CHFS) for 2017 and 2019, we conduct an empirical test. The findings reveal that an improvement in digital financial literacy significantly enhances the efficiency of household financial asset allocation. This effect is achieved by increasing household financial accessibility and promoting social interaction. Moreover, these results remain robust and significant after replacing the measurement indicators of the explanatory variable and accounting for potential policy interference. The heterogeneity analysis indicates that the positive effect of digital financial literacy is larger for rural households, those in non-key urban agglomerations, and non-financially vulnerable households. This study holds significant implications for enhancing the digital financial literacy of residents in China and promoting the rationalization of household financial asset allocation.

Keywords

digital financial literacy, household financial portfolio allocation efficiency, financial accessibility, social interaction

1. Introduction

According to data from the National Bureau of Statistics of China, in the first quarter of 2025, the national per capita disposable income reached 12179 yuan, with a year-on-year nominal growth of 5.5% and an actual growth rate of 5.6%. Among this, the per capita net property income was 1015 yuan, with a growth of 2.7%, accounting for 8.3% of the disposable income. This demonstrates that China's per capita property income exhibits the characteristics of "slow growth and low proportion", reflecting the relatively limited channels for residents to increase their wealth. As an important way to increase property income, the efficiency of household financial asset allocation is crucial for the preservation and appreciation of wealth.

Digital financial literacy originates from the intersection of financial literacy and digital literacy, with its theoretical connotations continuously enriched by the digital transformation of finance. It has roughly undergone three evolutionary stages: initially focusing on the skill dimension of conducting online financial

activities using digital tools [1]; subsequently emphasizing the comprehensive application of financial knowledge and digital financial skills [2], measuring aspects such as financial knowledge, digital payments, digital wealth management, and digital lending; in recent years, in response to the frequent occurrence of online fraud, scholars have further expanded it to include multi-dimensional abilities covering digital risk prevention and consumer rights protection awareness [3]. Overall, as human capital in the digital age, digital financial literacy reflects the ability of households to make decisions and manage risks using digital tools and financial knowledge. However, the "2023 Global Perspective on China's Digital Financial Literacy Research Report" indicates that the overall level of digital financial literacy among Chinese residents is low, especially among the elderly aged 60 and above and the youth aged 16–24, who exhibit significant shortcomings. This lack of literacy is likely to be a key constraint hindering families from optimizing asset allocation through digital financial services.

The ultimate objective of household financial asset investment is to maximize portfolio returns per unit of risk. Accordingly, some scholars have measured the efficiency of household financial asset allocation based on a comprehensive integration of risk and return [4]. A multitude of factors influence this allocation efficiency, encompassing individual cognition, household characteristics, background risks, and the external economic environment [5–7]. Existing literature demonstrates that enhancements in residents' financial literacy, digital literacy, and the usage of digital finance can effectively optimize household financial behaviors—such as consumption, saving, and investment—thereby significantly improving household financial well-being [8,9]. These findings provide a robust theoretical foundation for research concerning the impact of digital financial literacy on household financial behavior.

Based on this, the paper utilizes data from the 2017 and 2019 rounds of the China Household Finance Survey to explore the relationship between digital financial literacy and the efficiency of Chinese household financial asset allocation, and further analyzes its impact mechanism. The marginal contributions of this paper are reflected in the following aspects: Firstly, innovation in research perspective. First, this study offers an innovative research perspective. On the one hand, by deconstructing digital financial literacy into three dimensions—knowledge, skills, and risk awareness—it accurately characterizes residents' financial behavioral capabilities in the digital era. On the other hand, whereas the traditional breadth and depth of financial market participation merely reflect portfolio risk or investment scale, this paper comprehensively integrates both portfolio risk and return to measure the efficiency of household financial asset allocation. Secondly, innovation in research mechanism. Few scholars have directly studied the impact of digital financial literacy on the efficiency of household financial asset allocation, lacking exploration of its intrinsic action path and transmission mechanism. This paper explores the specific mechanism of the impact of residents' digital financial literacy on the efficiency of household financial asset allocation from the perspective of household financial accessibility and social interaction.

The subsequent parts of this paper are arranged as follows: Part II presents theoretical analysis and hypothesis formulation; Part III introduces the data, variables, and model; Part IV analyzes the empirical results of the impact of digital financial literacy on the efficiency of household financial asset allocation; and Part V concludes the research and offers policy suggestions.

2. Research Hypotheses

2.1 Digital Financial Literacy and Household Financial Portfolio Allocation Efficiency

In reality, due to cognitive limitations, information asymmetry, and subjective preferences, household asset allocation often deviates from the efficient frontier. As a key human capital in the digital age, the enhancement of digital financial literacy is mainly reflected in the improvement of financial knowledge, the advancement of digital financial skills, and the strengthening of digital financial risk awareness. These three aspects can effectively mitigate behavioral biases of investors [10], prompting household investment portfolios to approach the efficient boundary, and thereby enhancing risk-adjusted returns, which is to improve the efficiency of household financial asset allocation. The specific mechanisms are as follows:

Firstly, the improvement of residents' financial knowledge level can correct cognitive biases and enhance information processing capabilities, thus optimizing household financial asset portfolios. Investors with a high level of financial knowledge are better equipped to accurately understand market information and product

characteristics, thereby correcting cognitive biases caused by knowledge deficiency and reducing irrational investment. Facing risk assets with high information density, solid financial knowledge can significantly shorten the time for information acquisition and understanding, reducing the information costs of entering risk markets [11]. Additionally, digital financial literacy enhances households' sensitivity to market fluctuations, enabling them to dynamically adjust their asset portfolio structures in a more timely manner [9], thereby optimizing the efficiency of household financial asset allocation.

Secondly, the advancement of digital financial skills can reduce market frictions and promote asset portfolio diversification, thus optimizing household financial asset portfolios. Proficient digital skills enable households to access online platforms more conveniently, significantly reducing the time and capital costs of information acquisition and transaction execution [9,12]. This not only enhances households' willingness to participate in risk markets [11] but also broadens product selection channels, facilitating the transformation of household investment portfolios from single to diverse, effectively diversifying non-systematic risks [13]. Moreover, leveraging the advantages of big data and algorithms of financial institutions, households with strong digital financial skills can better utilize digital tools to accurately match their needs with risk-appropriate products, thereby reducing asset misallocation risks and improving asset allocation efficiency [14].

Thirdly, the enhancement of digital financial risk awareness can correct the deviation between subjective risk preferences and objective risk-taking capacity, thereby improving the efficiency of household financial asset allocation. Insufficient risk perception often leads households to overestimate market risks, causing their subjective risk preferences to be far below their actual risk tolerance levels, which in turn results in excessive concentration of assets in low-yield risk-free assets, missing out on risk premiums. However, the increase in risk awareness encourages households to rationally assess their own risk tolerance and product risk characteristics [15]. This not only enhances the willingness to participate in the market but also guides households to avoid excessive conservativeness within acceptable risk levels, obtaining risk premiums through reasonable allocation of risk assets, ultimately improving the overall efficiency of the asset portfolio [9].

Hypothesis 1. *Enhancing residents' digital financial literacy positively affects the efficiency of household financial asset allocation.*

2.2 Impact Mechanism of Digital Financial Literacy on Household Financial Portfolio Allocation Efficiency

2.2.1 Financial Accessibility

Financial accessibility refers to the ability of residents to equitably and conveniently access and utilize formal financial products and services at an affordable cost, overcoming geographical, informational, and other barriers. Residents' digital financial literacy—encompassing the comprehension of financial knowledge, the application of digital financial tools, and the awareness of digital risks—directly determines their capacity to effectively acquire and utilize financial resources. Specifically, digital financial literacy enhances household financial accessibility from the following three dimensions, thereby optimizing asset allocation efficiency:

First, it lowers transaction costs and expands the asset choice set, thereby enhancing the accessibility of financial products. Traditional financial services are associated with high information and transaction costs, which have historically led to low household market participation. Although digital finance has mitigated these frictions, it has concurrently introduced risks associated with identifying informal financial products. Residents with high digital literacy can proficiently navigate online platforms to effectively evade informal assets and digital fraud. Consequently, they can access diversified formal financial products, such as equities and mutual funds, at a lower cost [16], thereby strengthening their willingness to participate in risk-bearing markets [11]. According to Modern Portfolio Theory, an extensive asset choice set is a prerequisite for constructing an efficiently diversified portfolio. Therefore, digital literacy empowers households to allocate assets within a safer and broader scope, optimizing the risk-return profile of their investment portfolios through risk diversification mechanisms.

Second, it facilitates households' utilization of professional financial services, thereby improving the accessibility of financial services. Digitalization has given rise to innovative services such as robo-advisors. However, effectively leveraging these services requires overcoming the "digital threshold" and mitigating "self-exclusion" stemming from a lack of knowledge [17]. A higher level of digital literacy not only alleviates

this self-exclusion [13] but also helps households overcome technological barriers, increasing their willingness to proactively seek professional financial advice via digital channels [18]. Such professional services can compensate for households' inherent knowledge deficits, guiding them toward scientific and personalized asset allocation and directly enhancing allocation efficiency.

Finally, it strengthens the capacity for information acquisition and discernment, thereby improving the accessibility of financial information. A high level of digital financial literacy endows households with the ability to efficiently acquire and deeply process financial information. This enables households to make rational decisions based on a more comprehensive information set and avoid herd behavior. Consequently, it reduces the risk of asset misallocation caused by information asymmetry and significantly improves the rationality of their financial decision-making. Taken together, these mechanisms suggest a mediating role for financial accessibility.

Hypothesis 2. *The enhancement of digital financial literacy improves the efficiency of household financial asset allocation through the channel of increased household financial accessibility.*

2.2.2 Social Interaction

Social interaction is defined as the process in which individuals initiate social actions toward others and receive reactive responses. In the context of household economic behavior, social interaction emphasizes that residents' participation in financial markets is influenced by other members of their social groups. The enhancement of digital financial literacy drives the extension of households' social interactions and economic transactions into virtual networks, increasing the frequency of social interactions by lowering interaction costs. This not only consolidates existing kinship-based social networks but also expands Internet-based social circles, thereby enhancing the efficiency of household financial asset allocation by optimizing the information environment.

On the one hand, social interaction alleviates the constraints of bounded rationality by broadening information sources. Digital interaction platforms transcend the geographical boundaries of traditional social networks [2], thereby improving the efficiency of information exchange [19]. According to bounded rationality theory, households often struggle to make optimal decisions due to insufficient cognitive and information-processing capacities. Residents with high digital financial literacy can proactively utilize online platforms to acquire supplementary information, such as market trends [8], effectively mitigating asset misallocation caused by information asymmetry and lags [20]. Furthermore, leveraging their financial knowledge reserves, they can conduct in-depth analyses of the information gathered through interactions [21], providing a reliable basis for investment decisions and consequently improving portfolio returns.

On the other hand, social interaction may also trigger collective irrational behaviors, such as herd behavior and trend-chasing (buying high and selling low). However, households with high digital financial literacy can leverage their cognitive reserves to rationally screen and analyze the financial information acquired through social interactions. This enables them to overcome ambiguity aversion induced by information asymmetry and curb the aggressive sentiments associated with overconfidence. This process effectively averts decision-making errors driven by emotional biases, prompting households to construct more rational financial asset portfolios [22].

Hypothesis 3. *The enhancement of digital financial literacy improves the efficiency of household financial asset allocation through the channel of facilitating household social interaction.*

3. Research Design

3.1 Data and Sample

Considering that the COVID-19 pandemic, as a major public health emergency, has inflicted severe exogenous shocks on both the macroeconomic environment and micro-level household decision-making, this paper selects data from the 2017 and 2019 waves of the China Household Finance Survey (CHFS). To ensure data quality, the following preprocessing procedures are implemented:

(1) Considering the minimum age restrictions for accessing financial assets and the constraint that cognitive decline among the advanced elderly leads to intergenerational transfers in household financial decision-making,

only samples with household heads aged between 18 and 85 are retained.(2) Samples with negative total household income or negative total household assets are excluded.(3) Observations with missing values or outliers in the relevant variables are dropped.(4) Continuous variables, such as total assets and total income, are log-transformed and subsequently winsorized at the 1st and 99th percentiles to mitigate estimation biases caused by extreme sample outliers.

Ultimately, an unbalanced panel dataset spanning two waves (2017 and 2019) is constructed, yielding a total of 25,801 valid observations.

3.2 Variables and Definitions

3.2.1 Dependent Variable

The dependent variable is the efficiency of household financial asset allocation. We employ $Sharp\_Ratio_{it}$ and $Sortino\_Ratio_{it}$ as proxy variables for this efficiency [6]. The specific construction methods are as follows:

First, household financial assets are categorized into risk-free and risky financial assets. Subsequently, risky financial assets are classified into three major types—bonds, funds, and equities—based on their risk-return profiles. Given that the CHFS dataset only reports the amounts of financial assets allocated by households rather than the specific returns of each asset type, this paper employs market indices as proxies for the returns on various financial assets. Subsequently, the average return method is applied to measure the annual returns of different financial assets for each household [5]. Specifically, the proxy indices for each type of financial asset are determined as shown in Table 1. The historical average returns from January 2003 to December 2017 are utilized to represent the household's returns on various financial assets for the year 2017; the same procedure is applied for the year 2019.

Table 1: Alternative Indices for Financial Asset Returns and Data Sources.

Return Type	**Proxy Method**	**Data Source**
Equity asset return	Turnover-weighted average return of the Shanghai Composite Index and the Shenzhen Component Index	China Economic and Financial Database
Bond asset return	Return on the CSI Aggregate Bond Index	Wind Database
Fund asset return	Turnover-weighted average return of the Shanghai Fund Index and the Shenzhen LOF Fund Index	Wind Database
Risk-free rate	One-year lump-sum time deposit rate	People's Bank of China

From the above data, we derive the time series of excess returns and volatilities for various financial assets, which allows us to calculate the Sharpe and Sortino ratios for the household financial asset portfolio. The specific formulas are as follows:

$$Sharp\_Ratio_{it} = \left[E(R_{i,t}) - R_{f,t} \right] / \delta_{i,t} \tag{1}$$

$$Sortino\_Ratio_{it} = \left[E(R_{i,t}) - R_{f,t} \right] / \delta_{downi,t} \tag{2}$$

$$E(R_{i,t}) = \sum_{j=1}^{N} W_{ji,t} R_{ji,t} \tag{3}$$

$$\delta_{i,t}^{\ 2} = \sum_{j=1}^{N} \sum_{k=1}^{N} W_{ji,t} W_{ki,t} \sigma(R_{ji,t}, R_{ki,t}) \tag{4}$$

where $Sharp\_Ratio_{it}$ and $Sortino\_Ratio_{it}$ denote the Sharpe ratio and Sortino ratio of household i's financial asset portfolio in period t. $E(R_{i,t})$ and $\delta_{i,t}$ represent the expected return and standard deviation of the portfolio in period t. $R_{f,t}$ is the risk-free rate. $R_{ji,t}$ represents the return on asset class j held by household i in period t. $W_{ji,t}$ denotes the weight of asset class j in the total financial assets of household i in period t. $\sigma(\cdot)$ denotes the covariance. $\delta_{downi,t}$ is the downside standard deviation, in the Sortino ratio only accounts for the volatility of returns falling below the risk-free rate.

3.2.2 Key Explanatory Variable

The core explanatory variable in this study is DFL. First, we measure respondents' financial knowledge using interest rate calculation and inflation calculation [1]. Meanwhile, we construct two dummy variables for each of these questions: one indicating whether the answer is correct, and the other indicating whether the respondent provided a direct answer [8]. Second, to measure individuals' ability to apply digital financial tools in practice, we use several indicators, including whether the respondent holds yield-generating internet wealth management products, borrows through internet platforms, uses mobile payment, and holds stock accounts, mutual fund accounts, or credit cards. Finally, the dimension of digital financial risk awareness is designed to capture individuals' perception and understanding of the specific risks associated with digital financial products. Scores are assigned based on two items: the "comparison of risks between stocks and funds" and the "subjective judgment of the risks associated with internet wealth management products".

3.2.3 Mechanism Variables

First, financial accessibility. Based on the definition of financial accessibility, an index is constructed covering three dimensions: the accessibility of financial products, financial services, and financial information [13,23]. The specific indicators selected are as follows: (1) The number of bank accounts per capita in the household. (2) Whether the household's credit demand is satisfied. A value of 1 is assigned if the credit demand is met, and 0 if the demand exists but remains unmet. (3) The number of accounts opened by the household for purchasing risky financial assets. (4) Whether the household has access to financial or investment advisors. (5) The degree of the household's attention to financial information. A value of 2 is assigned for "very or fairly concerned", 1 for "average or rarely concerned", and 0 for "never concerned". (6) Whether the household obtains financial information via the Internet or wealth management apps (assigned a value of 1 for "yes" and 0 otherwise). Finally, PCA is employed on the above indicators to construct a comprehensive index of household financial accessibility.

Second, social interaction. We employ Principal Component Analysis (PCA) to construct a comprehensive index of social interaction, utilizing the logarithms of expenditures on weddings and funerals, holiday cash gifts, transportation, and communication [20].

3.2.4 Control Variables

This study selects control variables at three levels: the household head, the household, and the regional economy. Specifically, these include:

(1) Household head level: age of the household head and its square, gender (1 = male, 0 = female), marital status (1 = married, 0 otherwise), education level (an ordinal variable ranging from 1 to 6, where 1 = no schooling, 2 = primary school, 3 = junior high school, 4 = senior high school/vocational school, 5 = junior college/undergraduate, and 6 = postgraduate or above), registration type (4 = urban, 3 = unified, 2 = rural, 1 = other), and social pension insurance participation (1 if the household head is covered, 0 otherwise).

(2) Household level: old-age dependency ratio (the proportion of household members aged 60 and above), child dependency ratio (the proportion of members aged 16 and below), the logarithms of total household income and total household assets, and the share of non-financial assets.

(3) Regional economic level: economic development level (the logarithm of per capita GDP by province), regional population density, and the level of digital financial inclusion.

3.3 Model Specification

To address the sample selection problem, we employ the Heckman two-step procedure for estimation [5]. In the first step, a Probit model is used to estimate the selection equation for household participation in risky financial markets. The specific model is specified as follows:

$$riskfin_{it} = \begin{cases} 1, 若 riskfin_{it}^{*} > 0 \\ 0, 若 riskfin_{it}^{*} \le 0 \end{cases} \tag{5}$$

$$riskfin_{it}^{*} = \gamma_0 + \gamma_1 DFL_{it} + \gamma_2 X_{it} + \gamma_3 unhealthy_{it} + Province_i + Year_t + u_{it} \tag{6}$$

Equation (5) is the equation for the binary variable $riskfin_{it}$. The value of $riskfin_{it}$ depends on an unobservable latent variable $riskfin_{it}^{*}$. If $riskfin_{it}^{*} > 0$, indicating that the household participates in the risky financial market, then $riskfin_{it} = 1$; If $riskfin_{it}^{*} \le 0$, indicating that the household does not participate in the risky financial market, then $riskfin_{it} = 0$. i and t represent the observed household and year. u_{it} is distributed as normal. In Equation (6), DFL_{it} denotes the residents' digital financial literacy. X_{it} denotes the control variables. $Province_i$ and $Year_t$ denote province and time fixed effects, respectively. In addition, an exclusion restriction needs to be added to the selection equation in the first step. Since family members' health status significantly affects household participation in risky financial markets yet exerts no direct effect on the efficiency of financial asset portfolios [9], we use $unhealthy_{it}$ to serve as the exclusion restriction.

Next, the Inverse Mills Ratio λ_i is derived from the estimation results of the first-stage selection equation. The calculation formula is given by Equation (7). $\varnothing(\cdot)$ is the probability density function of the standard normal distribution. $\Phi(\cdot)$ is the standard normal cumulative distribution function. $W_i^{'}$ is the vector of key explanatory and control variables. $\hat{\gamma}$ is estimated coefficient vector.

$$\lambda_i = \varnothing\left(-W_i^{'}\hat{\gamma}\right)/\Phi\left(-W_i^{'}\hat{\gamma}\right) \tag{7}$$

In the second step, we estimate the impact of digital financial literacy on household financial asset allocation efficiency using OLS, and incorporate λ_i as an explanatory variable into Equations (8) and (9).

$$Sharp\_Ratio_{it} = \alpha_0 + \beta_0 DFL_{it} + \delta_0 X_{it} + \vartheta_0 \lambda_i + Province_i + Year_t + \varepsilon_{it} \tag{8}$$

$$Sortino\_Ratio_{it} = \alpha_1 + \beta_1 DFL_{it} + \delta_1 X_{it} + \vartheta_1 \lambda_i + Province_i + Year_t + \varepsilon_{it} \tag{9}$$

In Equations (8) and (9), $Sharp\_Ratio_{it}$ and $Sortino\_Ratio_{it}$ denote the Sharpe ratio and the Sortino ratio of the household financial asset portfolio, respectively, with higher values indicating greater efficiency in household financial asset allocation. If the coefficients of the Inverse Mills Ratio ϑ_0 and ϑ_1 are significantly non-zero, indicating the presence of sample selection bias, the Heckman two-step method is required to obtain unbiased estimation results. ε_{it} is the random disturbance term. The other variables are defined as in Equation (2).

Additionally, to test Hypotheses 2 and 3, two mechanism variables reflecting the impact of digital financial literacy on household financial asset allocation efficiency are proposed based on economic theory. Then, an OLS model is employed to identify the causal effect of digital financial literacy on the mechanism variables. The specific model specification is as follows:

$$M_{it} = \alpha_2 + \beta_2 DFL_{it} + \delta_2 X_{it} + Province_i + Year_t + \varepsilon_{it} \tag{10}$$

In Equation (10), M_{it} represents the mechanism variables, denoting financial accessibility (ss) and social interaction ($Social\_Interaction_{it}$), respectively. The other variables are defined as in Equations (8) and (9).

3.4 Descriptive Statistics

Table 2 reports the summary statistics of the variables. A multicollinearity test shows that all VIF values are below 10, ruling out any multicollinearity concerns and confirming the soundness of the selected variables.

Table 2: Results of descriptive statistics.

Variable	Observations	Mean	SD	Min	Max
DFL	25801	1.032	0.616	0.000	2.938
Sharpe	25801	0.431	0.262	0.000	0.984
Sortino	25801	2.322	2.131	0.000	14.571
age	25801	52.564	14.169	18.000	85.000
Age_squared	25801	29.638	15.121	3.240	72.250
Gender	25801	0.769	0.421	0.000	1.000
Marriage	25801	0.874	0.332	0.000	1.000
Edu	25801	3.630	1.131	1.000	6.000

Egistration	25801	3.035	0.910	1.000	4.000
Pension	25801	0.854	0.353	0.000	1.000
Older	25801	0.279	0.386	0.000	1.000
Childer	25801	0.118	0.167	0.000	0.778
Total_income	25801	11.283	1.162	5.775	13.477
Total_asset	25801	13.629	1.384	7.959	16.178
Nonfin	25801	0.755	0.240	0.000	1.000
LnGDP	25801	11.129	0.413	10.279	11.994
Pop_density	25801	5.982	1.055	2.248	7.996
DIFI	25801	5.722	0.127	5.500	6.019

Notes: Mean, Std. Dev., Min, and Max are rounded to three decimal places.

4. Empirical Analysis

4.1 Baseline Regression

Table 3 reports the estimation results regarding the impact of digital financial literacy on the efficiency of household financial asset allocation. The first-stage results of the Heckman model in Column (1) reveal that the marginal effect of digital financial literacy on participation in risky financial markets is 0.2522, which is significant at the 1% level. This indicates that households with higher levels of digital financial literacy exhibit a stronger willingness to participate in risky financial markets. Furthermore, the inverse Mills ratio in the second stage is positive and statistically significant, confirming that OLS estimates suffer from sample selection bias and thereby validating the appropriateness of employing the Heckman model.

The second-stage results in Columns (2) and (3) demonstrate that the coefficients of digital financial literacy on the Sharpe ratio and the Sortino ratio are 0.1499 and 0.7701, respectively, both significant at the 1% level. This suggests that digital financial literacy significantly enhances the excess returns per unit of total risk and per unit of downside risk borne by households, thereby substantially improving asset allocation efficiency. Notably, its enhancing effect is more pronounced on the Sortino ratio, indicating that a high level of digital literacy significantly strengthens households' ability to manage downside risk, consequently bolstering the robustness of their portfolios against market volatility. In summary, Hypothesis 1 is supported.

Table 3: Baseline Regression Results.

Variable	**(1)**	**(2)**	**(3)**
	First Stage	**Second Stage**	**Second Stage**
	Risky Financial Market Participation	**Sharpe**	**Sortino**
DFL	0.2522 *** （0.0035）	0.1499 *** （0.0049）	0.7701 *** （0.0536）
Unhealthy	−0.0207 *** （0.0069）		
IMR		0.0320 *** (0.0105)	−0.1712 * （0.1022）
Control Variables	YES	YES	YES
Year Fixed Effects	YES	YES	YES
Province Fixed Effects	YES	YES	YES
N	54675	25801	25801
Pseudo R^2/R^2	0.3188	0.2514	0.1002

*Notes: (1) ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively. This notation applies hereafter. (2) Robust standard errors are reported in parentheses. The first column reports marginal effects.*

There may be endogeneity issues between digital financial literacy and the efficiency of household financial asset allocation. On the one hand, the experience households accumulate during investment practices can enhance their digital financial literacy, and this reverse causality may lead to an overestimation of the results. On the other hand, unobservable omitted variables may also cause estimation bias. To address these issues,

this paper selects "the average digital financial literacy of other households in the community" as an instrumental variable.

Table 4 reports the IV regression results. The first-stage results show that the IV is significantly and positively correlated with digital financial literacy. The Kleibergen-Paap rk LM statistic is 836.98, which is significant at the 1% statistical level, and the Cragg-Donald Wald F statistic is 999.78, exceeding the critical value of 16.38 at the 10% level. These results rule out the problems of underidentification and weak instruments. The second-stage results demonstrate that the coefficients of digital financial literacy on the Sharpe ratio and the Sortino ratio remain significantly positive, which is highly consistent with the baseline regression, thereby further supporting Hypothesis 1.

Table 4: Instrumental Variable Regression Results.

Variable	**(1)** **Sharpe**	**(2)** **Sortino**
DFL	0.0565 *** （0.0148）	0.5317 *** （0.1317）
Control Variables	YES	YES
Year Fixed Effects	YES	YES
Province Fixed Effects	YES	YES
N	25801	25801
First Stage		
Community average household digital financial literacy	0.4122 *** （0.0135）	
Kleibergen-Paap rk LM	836.98 ***	
Cragg-Donald Wald F	999.78	

4.2 Robustness Test

4.2.1 Replacing the Core Explanatory Variable

To test the robustness of the results, this paper remeasures digital financial literacy using the entropy method and the score summation method. The regression results based on the entropy method in Columns (1) and (2) of Table 5 show that the coefficients of digital financial literacy on the Sharpe ratio and the Sortino ratio of household financial portfolios are 0.3906 and 3.9965, respectively, both significant at the 1% level. Meanwhile, the results based on the score summation method in Columns (3) and (4) yield corresponding coefficients of 0.0369 and 0.1293, which are similarly significant at the 1% level. The above findings are highly consistent with the baseline regression, reaffirming that an increase in digital financial literacy helps enhance the risk-adjusted returns of household financial portfolios—thereby improving the efficiency of household financial asset allocation. Thus, the baseline regression results remain robust.

Table 5: Results of Robustness Test by Replacing the Explanatory Variable.

Variable	**Entropy Weight Method**		**Equal-Weighted Summation Method**	
	(1)	**(2)**	**(3)**	**(4)**
	Sharpe	**Sortino**	**Sharpe**	**Sortino**
DFL	0.3906 *** （0.0117）	3.9965 *** （0.1544）	0.0369 *** （0.0012）	0.1293 *** （0.0134）
IMR	−0.1526 *** （0.0066）	−0.7506 *** （0.0508）	0.0418 *** （0.0108）	−0.556 *** （0.1133）
Control Variables	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Province Fixed Effects	YES	YES	YES	YES
N	25801	25801	25801	25801
$adj.R^2$	0.2584	0.1391	0.2498	0.093

4.2.2 Excluding Policy-Interfered Samples

The "Broadband China" strategy and "Smart City" pilots have continuously improved China's digital infrastructure and economic ecosystem, prompting residents to significantly enhance their digital financial literacy through "learning by doing" during high-frequency digital interactions. This leads to significantly higher literacy levels among residents in pilot cities. To exclude such policy interference, this paper constructs a regional digital infrastructure index based on data from the National Bureau of Statistics, encompassing five dimensions: telephone penetration rate, length of long-distance optical cables, internet penetration rate, number of broadband access ports, and number of domain names [24]. Subsequently, we exclude household samples located in regions with digital infrastructure levels above the average and re-estimate the model. The results in Table 6 show that the coefficient of digital financial literacy on allocation efficiency remains significantly positive, indicating that after controlling for the confounding effects of policy dividends, the baseline regression conclusions remain highly robust.

Table 6: Robustness Check Results Excluding Policy-Interfered Samples.

Variable	**(1)**	**(2)**
	Sharpe	**Sortino**
DFL	0.1749 *** （0.0078）	1.0035 *** （0.0902）
IMR	0.086 *** （0.0154）	0.3948 ** （0.1627）
Control Variables	YES	YES
Year Fixed Effects	YES	YES
Province Fixed Effects	YES	YES
N	13839	13839
$adj.R^2$	0.2476	0.1214

4.3 Mechanism Tests

To verify whether the enhancement of digital financial literacy improves household financial asset allocation efficiency by increasing household financial accessibility and promoting social interaction, this paper conducts mechanism tests.

Column (3) of Table 7 shows that the coefficient of digital financial literacy on household financial accessibility is 0.536 and significant at the 1% level, indicating that an improvement in residents' digital financial literacy effectively promotes household financial accessibility. Existing literature indicates that financial accessibility is crucial for enhancing the efficiency of household financial asset allocation, primarily achieved through two pathways: First, it broadens the investment scope, shifting assets from single savings to diversified portfolios such as wealth management products, mutual funds, and stocks, thereby effectively diversifying market risks [16]. Second, it lowers transaction and information costs, reduces market frictions, and incentivizes households to seek professional consultation to overcome cognitive limitations. Together, these two pathways enhance households' responsiveness to portfolio adjustments, ultimately improving asset allocation efficiency [9]. In summary, Hypothesis 2 is supported.

Column (4) of Table 7 reveals that the coefficient of digital financial literacy on household social interaction is 0.123 and significant at the 1% level, demonstrating that an enhancement in digital financial literacy strengthens households' participation in social interactions. Previous studies have pointed out that households' participation in social interactions contributes to improving their financial asset allocation efficiency [20]. Specifically: First, social interactions expand households' decision-making information sets through information transmission mechanisms, thereby reducing decision-making biases caused by information scarcity [25]. Second, households with high digital financial literacy can leverage their cognitive reserves to rationally filter financial information acquired during interactions, effectively avoiding emotional decision-making errors and facilitating the construction of optimal asset portfolios [22]. In summary, Hypothesis 3 is supported.

Table 7: Mechanism Test Results.

Variable	**(1)**	**(2)**	**(3)**	**(4)**
	Sharpe	**Sortino**	**Financial_Accessibility**	**Social_Interaction**

DFL	0.1499 *** （0.0049）	0.7701 *** （0.0536）	0.6267 *** （0.009）	0.1525 （0.0072）
Control Variables	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Province Fixed Effects	YES	YES	YES	YES
N	25801	25801	25801	25801
$adj.R^2$	0.2514	0.1002	0.4257	0.7967

4.4 Heterogeneity Analysis

4.4.1 Urban-Rural Heterogeneity Analysis

Given the unbalanced urban-rural development in China, which leads to significant disparities in digital infrastructure, access conditions, and financial receptivity, this paper divides the sample into urban and rural subsamples to examine the heterogeneous effects of digital financial literacy on household financial asset allocation efficiency.

The subsample regression results in Table 8 indicate that digital financial literacy significantly improves the asset allocation efficiency of both urban and rural households, but this enhancing effect is more pronounced among rural households. A Chow test confirms that the difference between the two groups is significant at the 1% level. This disparity primarily stems from the fact that urban households typically possess extensive traditional financial channels and a solid cognitive foundation; thus, the enhancement of digital financial literacy serves more as a refinement of their existing knowledge system, yielding relatively limited marginal improvements. In contrast, rural households have long been constrained by insufficient financial accessibility and information isolation. For them, improved digital financial literacy effectively helps overcome information and channel barriers, substantially optimizing their asset allocation behavior and thereby exhibiting higher marginal effects.

Table 8: Regression Results for Urban-Rural Heterogeneity.

Variable	**Sharpe**		**Sortino**	
	(1)	**(2)**	**(3)**	**(4)**
	Urban	**Rural**	**Urban**	**Rural**
DFL	0.1364 *** （0.0055）	0.1742 *** （0.0162）	0.7016 *** （0.0589）	0.8171 *** （0.1278）
Control Variables	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Province Fixed Effects	YES	YES	YES	YES
N	21036	4765	21036	4765
$adj.R^2$	0.2502	0.3044	0.0798	0.3818
Chow test P-value	0.0000		0.0000	

4.4.2 Regional Heterogeneity Analysis

According to China's regional development planning, this paper divides the sample into key and non-key urban agglomerations to examine regional heterogeneity. The subsample regression results in Table 9 show that digital financial literacy has a significant positive impact on the asset allocation efficiency of both groups of households, but this enhancing effect is more pronounced in non-key urban agglomerations. A Chow test confirms that the cross-group difference is significant at the 1% level.

The underlying logic of this phenomenon is twofold. On the one hand, for households in non-key regions, improvements in digital financial literacy enable them to effectively leverage digital tools to overcome geographical constraints and access a broader range of financial resources, thereby substantially improving their asset allocation efficiency. On the other hand, the high living costs in key urban agglomerations—particularly regarding housing, education, and healthcare—exert a significant crowding-out effect on households' investable funds. To meet daily expenditures, these households exhibit a preference for highly

liquid and low-risk assets, which consequently weakens the marginal effect of enhanced digital financial literacy.

Table 9: Regional Heterogeneity Test Results.

Variable	Sharpe		Sortino	
	(1)	(2)	(3)	(4)
	Key Urban Agglomerations	Non-Key Urban Agglomerations	Key Urban Agglomerations	Non-Key Urban Agglomerations
DFL	0.1365 *** （0.0063）	0.1595 *** （0.0087）	0.6802 *** （0.0665）	0.8787 *** （0.0963）
Control Variables	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Province Fixed Effects	YES	YES	YES	YES
N	15377	10424	15377	10424
$adj.R^2$	0.2647	0.2339	0.0969	0.1054
Chow test P-value	0.0000		0.0000	

4.4.3 Heterogeneity Analysis by Household Financial Vulnerability

Given that household wealth conditions affect financial asset allocation, we partition the sample by financial vulnerability. We use the "household financial buffer" to capture financial vulnerability [26]. A negative buffer implies that a household cannot mobilize adequate funds to cope with financial hardship, thus falling into a financially vulnerable state; conversely, a non-negative buffer indicates resilience. The formula is specified as follows:

$$FM_{it} = HI_{it} + HLA_{it} - HC_{it} - HD_{it} \tag{11}$$

In Equation (11), FM_{it} represents the household financial buffer, defined as the contingency funds available to navigate financial hardship. HI_{it} is household total income. HLA_{it} is liquid assets held by the household that can be readily converted into cash, including time deposits, demand deposits, and cash. HC_{it} is total household consumption, which consists of expected and unexpected components. The former refers to routine living expenditures, whereas the latter primarily captures medical expenditures. HD_{it} is total household debt.

The subsample regression results in Table 10 indicate that digital financial literacy exerts a significant positive impact on the asset allocation efficiency of both types of households, but this enhancing effect is more pronounced among non-financially vulnerable households. A Chow test confirms that this cross-group difference is significant at the 1% level. The underlying reasons for this phenomenon may be twofold. On the one hand, non-financially vulnerable households, characterized by abundant assets and strong risk resilience, can leverage digital financial literacy to overcome information barriers and reduce transaction costs, thereby effectively utilizing digital tools for investment diversification and refined asset allocation. In contrast, vulnerable households are subject to liquidity constraints, with funds primarily prioritized to meet basic subsistence needs, making it difficult for digital financial literacy to be effectively translated into actual investment behavior. On the other hand, guided by risk control principles, financial institutions exhibit a preference for creditworthy and financially stable households. This enables the latter to more easily access low-cost financial resources, which further amplifies the asset optimization effect of digital financial literacy.

Table 10: Heterogeneity Analysis Results by Household Financial Vulnerability.

Variable	Sharpe		Sortino	
	(1)	(2)	(3)	(4)
	Non-Financially Vulnerable	Financially Vulnerable	Non-Financially Vulnerable	Financially Vulnerable
DFL	0.1444 *** （0.006）	0.0584 *** （0.0084）	0.753 *** （0.0632）	0.3111 *** （0.1054）
Control Variables	YES	YES	YES	YES

Year Fixed Effects	YES	YES	YES	YES
Province Fixed Effects	YES	YES	YES	YES
N	18325	7476	18325	7476
$adj.R^2$	0.2637	0.1804	0.1058	0.0693
Chow test P-value	0.0000		0.0000	

5. Conclusions and Recommendations

This study demonstrates that the positive impact of digital financial literacy on household financial asset allocation efficiency remains significant even after addressing endogeneity concerns and conducting robustness checks—including variable substitution and the exclusion of policy interference. Mechanism tests confirm that this effect operates primarily through two channels: improving household financial access and enhancing social interaction. Furthermore, heterogeneity analysis reveals significant group differences: the enhancing effect of digital financial literacy is more pronounced among rural households, those in non-key urban agglomerations, and non-financially vulnerable households, compared to their urban, key urban agglomeration, and financially vulnerable counterparts. Based on these findings, this paper proposes the following policy recommendations:

First, build a robust digital financial education system. Utilizing new media to popularize financial knowledge, the focus should be on improving residents' digital application and risk-awareness skills to foster rational investment. Second, optimize the digital financial service ecosystem. This involves advancing inclusive infrastructure coverage, incentivizing low-threshold and user-friendly products, and enhancing internet governance to eliminate misinformation, thereby converting financial literacy into actual asset allocation capacity. Third, precisely innovate inclusive products for the long-tail population. Moving beyond a "one-size-fits-all" model, institutions should be guided to develop agriculture-cycle-aligned products for rural areas, stratified service systems for lower-tier cities, and low-risk, high-liquidity emergency savings tools for vulnerable families.

References

[1] Prasad H; Meghwal D; Dayama V. (2018). Digital financial literacy: a study of households of udaipur. *Journal of Business and Management*, 523–532.

[2] Tony N; Desai K. (2020). Impact of digital financial literacy on digital financial inclusion. *International Journal of Scientific and Technology Research*, *9*(1), 1911–1915.

[3] Morgan P.J; Huang B; Trinh L.Q. (2019). The need to promote digital financial literacy for the digital age. In Realizing Education for All in the Digital Age,T20 Report, 40－46.

[4] Wu W.X; Wu K; Zhang X.Y. (2018). Financial literacy and household portfolio effectiveness. *Journal of International Financial Studies*, (5), 66–75.

[5] Wu W.X; Qiu Y.C; Zhang L.W. (2015). Effectiveness of Chinese household investment portfolios: based on the Sharpe ratio. *The World Economy*, *38*(1), 154–172.

[6] Pelizzon L; Weber G. (2009). Efficient portfolios when housing needs change over the life cycle. J*ournal of Banking and Finance*, *33*(11), 2110–2121.

[7] Zang X.H; Dong J.X. (2023). Can social pension insurance improve the effectiveness of household portfolios?—a study from the life-cycle perspective. *Research on Economics and Management*, *44*(10), 33–53.

[8] Van R.M; Lusardi A; Alessie R. (2011). Financial literacy and stock market participation. *Journal of*

Financial Economics, *101*(2), 449–472.

[9] Wu Y; Li X; Li J, et al. (2021). Digital financial development and household financial portfolio effectiveness. *Management World*, *37*(7), 92–104+7.

[10] Wu W.X; Zhang X.Y; Wu K. (2021). Financial literacy and household saving rate: an explanation based on financial planning and borrowing constraints. *Journal of Financial Research*, (8), 119–137.

[11] Zhou G.S; Liang Q. (2018). Internet use, market frictions, and household risky financial ssset investment. *Journal of Financial Research*, (1), 84–101.

[12] Wang X.H; Zhao Y.X. (2022). Digital financial development and the Urban-Rural disparity in household financial accessibility. *Chinese Rural Economy*, (1):44–60.

[13] Liu S.J; Guan F.Q. (2024) .Impact of digital financial literacy on financial asset allocation of rural households: from the perspective of financial availability. *Wuhan Finance*, (6), 57–64.

[14] Wang X.H; Liu Y; Song M. (2023). Digital capability and household risky financial asset allocation. *Chinese Rural Economy*, (11), 102–121.

[15] Si C.N; Zhang X.F. (2024). Digital financial literacy and household economic resilience—an analysis based on CHFS microdata. *Modern Finance and Economics (Journal of Tianjin University of Finance and Economics)*, (12), 52–67.

[16] Jiang T; Li W; Sun W, et al. (2024). Digital financial inclusion and diversity of household financial asset allocation: evidence from China. *Australian Economic Papers*, *64*(2), 205–220.

[17] Chai S.J; Yang C; Lim Y.K. (2025). Digital divide and household portfolio investment efficiency: evidence from China. *Emerging Markets Review*, *70*, 101407.

[18] Calcagno R; Monticone C. (2015). Financial literacy and the demand for financial advice. *Journal of Banking and Finance*, *50*, 363–380.

[19] Li J; Alexis M. (2019). Promoting financial literacy through a digital platform: a pilot study in Luxembourg. *International Journal of Finance & Economics*, *26*(1), 73–87.

[20] Chai S.J. (2017). Social capital and household portfolio effectiveness. *China Economic Issues*,(4), 27–39.

[21] Fu Q; Ma L.X; Hu J.L. (2022). Impact of social capital on financial asset allocation of rural households. *Economic Review*, (7), 118–128.

[22] Liu C; Zhang Y.R; Li G.C. (2025). Digital financial capability and household wealth accumulation: evidence from the China Household Finance Survey. *Journal of Econometrics*, *5*(2), 442–462.

[23] Zhu W.P; Lin Y. (2022). Financial literacy, financial inclusion, and pension financial asset allocation. *Journal of Shanxi University of Finance and Economics*, *44*(3), 43–57.

[24] Ji, Y.L; Li, J.Y; Zhao H. (2022). Digital infrastructure construction and tourism economic growth: a mechanism test based on mediating and moderating effects. *On Economic Problems*, (7), 112–121.

[25] Wang X.H; Li X.R; Song M, et al. (2024). Digital finance, digital divide, and household financial portfolio effectiveness: an analysis from the perspective of Urban-Rural disparity. *Contemporary Economic Science*, *46*(2), 45–58.

[26] Li B; Zhu T.H. (2022). Debt leverage, financial fragility, and heterogeneous household consumption behavior. *Journal of Financial Research*, (3), 20–40.

Funding

This research received no external funding.

Conflicts of Interest

The authors declare no conflict of interest.

Acknowledgment

This paper is an output of the science project.