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Impact of Housing Liabilities on Household Asset Allocation

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Abstract: *For households as a socially composed micro-group, the rise of household housing liabilities can have a significant impact on household asset allocation. This paper utilises the latest data from the China Household Finance Survey (CHFS) 2019 to construct Probit and Tobit models to measure the actual impact of housing liabilities on household asset allocation, respectively. It is found that due to the mortgage repayment pressure brought about by rising housing liabilities, households will adjust their asset allocation accordingly, i.e., increase the allocation of risk-free assets represented by savings and reduce the allocation of risky assets represented by stocks and funds, which provides empirical reference for policy formulation to prevent household debt risk.*

Keywords: *Housing liabilities; Asset allocation; Household finance*

1. Introduction

Residents' loans are mainly concentrated in individual housing mortgage loans, that is, housing liabilities in the form of housing has become the main form of household liabilities in China, which triggered the rising leverage ratio of China's residential sector. Excessive accumulation of household housing liabilities will not only affect China's economic development output, but also affect the distribution of assets in the family unit. Therefore, the rapid growth of housing liabilities has aroused concern and worry from all quarters. On the macro side, the excessive accumulation of financial assets in the real estate sector may lead to false prosperity, consumption imbalance and debt leverage risks, further triggering non-diversifiable financial risks. On the micro front, most households have an obligation to make housing purchases through personal mortgage loans, and the resulting housing liabilities will also affect the asset allocation of households. The accumulation of housing debt affects household well-being, household investment and consumption, and increases household vulnerability. Therefore, it is particularly important to prevent the risk of residential housing debt. Residents' asset selection behavior is directly related to family property income and welfare levels, and the report of the twentieth Party Congress proposes "increasing the property income of urban and rural residents through a variety of channels", so that the rational allocation of assets by residents is of great significance in terms of increasing property income, raising the level of family welfare and promoting economic prosperity.

Some scholars at home and abroad have conducted relevant theoretical and empirical studies on issues such as household asset allocation brought about by housing liabilities. For example, Chetty et al [1]. distinguished the impact of housing net worth and housing liabilities, and found that there is a positive correlation between housing net worth and stock investment, while there is a negative correlation between housing liabilities and stock investment; Xiao Binqing and other scholars[2] pointed out that, when the household indebtedness reaches a certain proportion, the impact of indebtedness on household welfare will turn from positive to negative, and that when the housing stock of indebtedness reaches a certain level, it will increase the consumption inequality between households[3] . On this basis, this paper distinguishes between the effects of housing net worth and housing indebtedness, and specifically examines the impact of housing indebtedness on the asset choices of Chinese households.

So, does the existence of household housing liabilities affect the asset allocation behaviour of households? Questions such as what is the measure of its influence deserve further exploration. Based on this, this paper constructs a Probit model and a Tobit model using the China Household Finance Survey (CHFS) 2019 data to measure the actual impact of housing liabilities on households' asset allocation through the data and to test the differential impact of housing liabilities on households' asset choices.

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2. Brief Review of the Literature

Currently in the academic world there are two main views on the impact of housing liabilities on household asset choice. Yin Zhichao, Zhao Naibao and other scholars believe that housing liabilities crowd out households' choice of risky assets and promote the choice of risk-free assets[4-6] ; Gong Liutang, Zhou Xianbo and other scholars believe that housing liabilities promote households' choice of risky assets and crowd out households' choice of risk-free assets[7-8] .

The study of housing liabilities crowding out households' risky assets and promoting the demand for risk-free assets focuses on two aspects: asset liquidity and risk exposure. On the one hand, household assets, mainly in the form of housing, are relatively illiquid, derived from the Keynesian theory of money demand, the household sector should hold a relative proportion of liquid funds to cope with a variety of emergencies, while housing assets increase household illiquidity risk, so households choose to reduce risky asset holdings and boost holdings of monetary assets, i.e., risk-free assets, in order to balance the demand for liquidity[9-11] ; on the other hand, household Long-term mortgages require regular, long-term expenditures, compared to which household incomes are exposed to uncertainty, thus increasing the household sector's exposure to risk, and reducing the household's demand for risky assets to balance the household sector's exposure to risk[12-14] .

The study of housing indebtedness to promote households' demand for risky assets focuses on three aspects: risk diversification, the role of collateral and income expectations[15].Firstly, according to portfolio investment theory, diversification of risk requires portfolio investment, so households diversify the risk of house price fluctuations by investing in several risky assets in the financial market and holding a certain proportion of risk-free assets[16-17].Secondly, rising house prices can increase the value of household housing and increase the value of housing collateral, and households can obtain refinancing through housing mortgage[18]. Third, some scholars have empirically confirmed the positive relationship between housing debt and equity holdings, which is mainly caused by unobservable future income[19-20] .

Based on this, this paper selects household asset allocation as the object of study, which includes both risky and risk-free asset allocation, and aims to measure the actual impact of housing liabilities on household asset allocation by constructing Probit and Tobit models.

3. Data Sources, Variable Selection and Model Setting

3.1. Data Sources

This paper uses data from the China Household Finance Survey (CHFS), which is designed to collect information on households' assets and liabilities, income and expenditures, insurance and protection, and demographics and employment. The samples of 28,142, 37,289, 40,011 and 34,643 households were obtained in 2013, 2015, 2017 and 2019, respectively. The consumption level of China's residents changes year by year, so this paper selects the 2019 CHFS data, which is the most up-to-date and has the widest survey coverage. In data processing, the data are matched according to the household code of the corresponding year, while the housing debt, household income, and household net worth variables are subjected to the upper and lower 1 per cent shrinking tail treatment to reduce the interference of extreme values, and the invalid information samples are deleted, obtaining a total of 30,388 observations.

3.2. Selection of Variables

a) Explanatory variables. The amount of housing debt was used as the core explanatory variable.

b) Explained variables. Household asset allocation can be divided into risk-free asset allocation and risky asset allocation, and the main risk-free asset involved in the CHFS questionnaire is household savings, and the main risky assets involved are household stock holdings and fund holdings. Therefore, this paper selects savings asset holdings, stock asset holdings, fund asset holdings, savings asset ratio, stock asset ratio, and fund asset ratio as the explanatory variables to reflect household asset choices. Among them, stock asset holdings and fund asset holdings are dichotomous dummy variables, and stock and fund asset ratios measure the share of stock assets and fund assets in household financial assets, respectively.

c) Control variables. Individual characteristics include gender, age , years of education , marital status, financial literacy, and degree of risk appetite.

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3.3. Modelling

This paper uses a probit model with panel data dichotomous discrete variable regression to analyse the impact of housing liabilities on households' asset allocation, while since the shares of savings assets, stock assets and fund assets in financial assets are truncated, this paper uses a Tobit model with panel data truncated variable regression to analyse the impact of housing liabilities on the share of risk-free assets represented by savings assets and the share of broader risky assets represented by stocks and funds, respectively. Represented by savings assets, and broad risky assets represented by stocks and funds as a share of financial assets. Based on this, the Probit model is set up as follows:

$$Y_{ijt}^{*} = \beta_0 + \beta_1 Housing\_Debt_{ijt} + \sum_{n=1}^{6} \alpha_n C_n + \mu_i \quad (1)$$

$$Y_{ijt} = \begin{cases} 1, Y_{ijt}^{*} > 0 \\ 0, Y_{ijt}^{*} \le 0 \end{cases} \quad (2)$$

The Tobit model is set up as follows:

$$Y_{ijt1}^{*} = \beta_0 + \beta_1 Housing\_Debt_{ijt} + \sum_{n=1}^{6} \alpha_n C_n + \mu_i \quad (3)$$

$$Y_{ijt1} = \max\left(0, Y_{ijt1}^{*}\right) = \begin{cases} 1, Y_{ijt1}^{*} > 0 \\ 0, Y_{ijt1}^{*} \le 0 \end{cases} \quad (4)$$

Where Y_{ijt} is a dummy variable for savings, stock and fund asset holdings of household i in province j in year t, and Y_{ijt1} is a dummy variable for the share of savings, stock and fund asset holdings of household i in province j in year t. When Y_{ijt}^{*} and Y_{ijt1}^{*} are greater than 0 take 1, otherwise take 0; $Housing\_Debt_{ijt}$ is used to measure the housing liabilities of household i in province j in year t; $\sum_{n=1}^{6} \alpha_n C_n$ are control variables; μ_i is the random perturbation term.

4. Empirical Analysis

4.1. Model Regression Results for Savings Holdings

The Saving Funds Probit model seeks to find the factors that influence whether households hold saving funds or not, and mainly explains whether the explanatory variable of household housing liabilities affects the asset allocation of households. The specific results are shown in Table 1.

Table 1: Probit model, Tobit model of housing liabilities on savings fund holdings.

	Probit model of savings funds			Tobit model for savings funds		
	ratio	Z-value	marginal effect	ratio	T-value	marginal effect
Ln(Housing Debt)	0.031*** (0.008)	7.17	0.03*** (0.007)	0.019*** (0.001)	6.71	0.005*** (0.009)
sexual	0.071*** (0.009)	5.71	0.04*** (0.002)	0.062*** (0.004)	4.71	0.061*** (0.002)
age	0.087*** (0.002)	10.31	0.06*** (0.001)	0.048*** (0.001)	5.90	0.033*** (0.001)
edu	0.070*** (0.001)	8.98	0.01*** (0.005)	0.021*** (0.008)	6.89	0.001*** (0.001)
marry	-0.098*** (0.005)	-9.10	-0.02*** (0.007)	-0.032*** (0.008)	-6.76	-0.017*** (0.002)
fin_edu	0.033*** (0.002)	8.38	0.05*** (0.001)	0.056*** (0.009)	8.90	0.034*** (0.002)
risk	-0.012*** (0.007)	-9.32	-0.07*** (0.009)	-0.038*** (0.005)	-9.39	-0.093*** (0.001)
N	30388	30388	30388	30388	30388	30388

Note: Standard errors within ***, ** and * indicate significant at the 1 per cent, 5 per cent, and 10 per cent levels, respectively.

As can be seen from Table 1, the marginal effect of household housing liabilities on the holding of household savings funds is 0.03, indicating that housing liabilities promote the holding of household savings funds, which suggests that holding of household savings funds is affected by changes in

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household housing liabilities due to changes in household housing liabilities, i.e., an increase in household housing liabilities leads to an increase in the holding of savings funds by households, holding the same control variables, such as gender, age, and education, unchanged.

In the Tobit model of savings funds, this paper finds a positive relationship between the explanatory variable of household housing liabilities and the share of household savings fund holdings, i.e., housing liabilities contribute to the share of household savings asset holdings.

This phenomenon may be explained by the fact that money market investment in the country is a low-yield, stable way of allocating funds, and that a higher degree of liquidity in exchange for a smoother return is a characteristic of the bank savings investment approach compared to the cash approach. As household indebtedness increases, households may face rising economic pressures for the purpose of stabilising cash flow to service debt, in which case financial decision makers usually store assets in an easily realisable way to meet possible expenses, such as saving cash.

4.2. Model Regression Results for Stock Holdings

The Stock Holding Probit model seeks to find the factors that influence whether a household holds stocks or not, and mainly explains whether the explanatory variable of household housing debt affects a household's stock holding allocation. The specific results are shown in Table 2.

Table 2: Probit model, Tobit model of housing liabilities on equity holdings.

	Equity Funding Probit Model			Equity capital Tobit model		
	ratio	Z-value	marginal effect	ratio	T-value	marginal effect
Ln(Housing Debt)	-0.022*** (0.002)	-9.15	-0.06*** (0.001)	-0.021*** (0.005)	-8.21	-0.006*** (0.003)
sexual	0.045*** (0.002)	3.23	0.07*** (0.007)	0.033*** (0.003)	4.23	0.033*** (0.008)
age	0.045*** (0.007)	4.56	0.02*** (0.001)	0.040*** (0.006)	9.92	0.097*** (0.003)
edu	0.098*** (0.007)	10.56	0.07*** (0.002)	0.038*** (0.001)	7.48	0.008*** (0.007)
marital status	-0.034*** (0.007)	-10.11	-0.08*** (0.003)	-0.068*** (0.007)	-3.49	-0.068*** (0.005)
fin_edu	0.021*** (0.001)	6.33	0.07*** (0.005)	0.039*** (0.003)	5.91	0.059*** (0.007)
risk	-0.066*** (0.006)	-6.70	-0.09*** (0.001)	-0.059*** (0.006)	-7.39	-0.072*** (0.009)
N	30388	30388	30388	30388	30388	30388

Note: Standard errors within ***, ** and * indicate significant at the 1 per cent, 5 per cent, and 10 per cent levels, respectively.

As can be seen from Table 2, the marginal effect of household housing liabilities on household equity holdings is significantly negative (-0.06), indicating that housing liabilities crowd out household savings holdings, holding constant the control variables of gender, age, education, and marital status. Since changes in household housing liabilities affect household stock holdings inversely, i.e., an increase in household housing liabilities causes households to reduce their holdings of stocks.

In the Tobit model of stock holdings, this paper finds a negative relationship between the explanatory variable of household housing debt and the share of household stock holdings, i.e., housing debt crowds out the share of household stock holdings.

4.3. Model Regression Results for Fund Holdings

The Fund Holding Probit model aims to find the factors that influence whether a household holds funds or not, and mainly explains whether the explanatory variable of household housing debt affects a household's fund holding allocation. The specific results are shown in Table 3.

As can be seen in Table 3, the marginal effect of household housing liabilities on household equity fund holdings is also significantly negative (-0.08) indicating that housing liabilities crowd out household fund asset allocation. Among the remaining explanatory variables marital status and risk preference show

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crowding out effects on fund holdings, while gender, age, education and financial literacy all show significant positive correlations on fund holdings, which is in line with the conclusions drawn from previous literature.

Table 3: Probit model, Tobit model of housing liabilities on fund holdings.

	Probit model of the Fund's capital			Tobit modelling of the Fund's capital		
	ratio	Z-value	marginal effect	ratio	T-value	marginal effect
Ln(Housing Debt)	-0.078*** (0.002)	9.57	-0.08*** (0.003)	-0.083*** (0.005)	-9.47	-0.008*** (0.001)
sexual	0.050*** (0.003)	7.49	0.08*** (0.007)	0.038*** (0.002)	4.52	0.028*** (0.008)
age	0.038*** (0.007)	4.46	0.07*** (0.008)	0.073*** (0.003)	3.85	0.063*** (0.007)
edu	0.038*** (0.007)	8.38	0.08*** (0.005)	0.096*** (0.007)	10.36	0.007*** (0.003)
marital status	-0.058*** (0.003)	-8.47	-0.47*** (0.004)	-0.063*** (0.003)	-8.45	-0.084*** (0.002)
fin_edu	0.085*** (0.006)	9.56	0.06*** (0.009)	0.094*** (0.003)	9.63	0.075*** (0.008)
risk	-0.038*** (0.004)	-7.56	-0.13*** (0.002)	-0.034*** (0.008)	-6.48	-0.045*** (0.007)
N	30388	30388	30388	30388	30388	30388

Note: Standard errors within ***, ** and * indicate significant at the 1 per cent, 5 per cent, and 10 per cent levels, respectively.

In the Tobit model regression results for fund holdings it can be seen that household housing debt holdings show a significant negative correlation to fund holdings.

Overall, an increase in housing indebtedness among households reduces the probability of investing capital in risky markets, i.e., equity and fund assets, and the proportion of capital allocated to risky markets. The reasons for this may be analysed as the fact that risky assets represented by stocks and funds are risky while offering high returns, that households need to set aside a certain amount of cash flow each month to repay the monthly interest rate when carrying housing liabilities, and that holding stocks and fund assets is less effective in stabilising the cash flow compared to risk-free assets represented by savings funds, as they have less cash-flow capacity. Therefore, when a household holds housing liabilities, the household decision maker will stabilise the monthly cash flow by allocating less risky assets, thus rationalising the overall asset allocation of the household.

5. Conclusions and Recommendations

5.1. Conclusions of the Study

Due to the influence of housing factors, the leverage ratio of China's residential sector is rising, and housing liabilities have an important impact on household financial and economic behavior, so it is particularly important to prevent the risk of household sector debt. Based on this, this paper conducts an empirical study on the impact of housing liabilities on household asset allocation by applying the Probit model and the Tobit model on the basis of survey data from the China Household Finance Survey (CHFS) (2019).

The results of this paper show that an increase in household housing debt has a positive effect on the allocation of risk-free assets and a negative effect on the allocation of risky assets. For the purpose of stabilising cash flow for debt repayment, the increase in household indebtedness will lead to an increase in financial pressure, and a certain amount of cash flow needs to be set aside each month for monthly interest repayment, while holding stock and fund assets is less effective in stabilising cash flow. Therefore, households usually store their assets in a way that can be easily realised. Our money market investments are low-yielding and highly stable, while risky assets are characterised by high returns, high risk and high liquidity, and households prefer risk-free assets represented by cash in savings. Therefore, when households hold housing liabilities, household decision makers will reduce the allocation of risky assets, stabilise monthly cash flow, improve household risk resistance and rationalise the overall household asset allocation.

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5.2. Policy Recommendations

The findings of this paper have certain policy implications. Firstly, from the family level, the debt constraint of the family should be eased, the asset allocation ratio should be controlled within a reasonable range, and some risky asset allocation can be carried out while ensuring liquidity, but liquidity should be the main focus, to avoid excessive risky allocations that adversely affect the family's assets, capital stability, and risk-resistant ability. The improvement of the national economic level and distribution system can, to a certain extent, alleviate the debt burden of families, increase the income of low-income people and expand the middle-income group, and at the same time, improve the gap between the rich and the poor in the process of income redistribution, alleviate the inequality of conspicuous consumption, and increase the accumulation of wealth of the family in the process of economic upgrading to alleviate the financial burden.

From the government level, firstly, we should reasonably control the ratio of income to liabilities in the household sector, ensure the degree of indebtedness of households, strengthen the regulation of housing prices, review of individual loans, and approval of the qualifications for purchasing individual housing to ensure that housing loans are granted to households with precise needs, and at the same time strengthen the attention to the housing leverage ratio of the local household sector, avoid excessive concentration of assets in the real estate sector, and ensure that the financial to the industry and households are reasonable supportability; secondly, we should accelerate the construction of the multi-level capital market, provide more and more comprehensive investment channels for family investment, regulate the order of the capital market, and make funds flow to the capital market in a reasonable manner, so as to alleviate the accumulation of family debts and at the same time help families accumulate wealth and realise the preservation and appreciation of family wealth; thirdly, we should guide families to set up a correct borrowing and lending concept and consumption philosophy, so as to prevent the over-accumulation of family liabilities. It should guide residents to borrow funds through formal channels, give play to the guidance of inclusive finance, pay attention to the asset allocation of low- and middle-income families, and provide families with professional counselling channels on financial issues when necessary, so as to guide families to rationally allocate their funds.

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