CSSS 566 CS&SS / STAT 566 CAUSAL MODELING
Spring 2024
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Risky Assets and Household Investment Behaviors: The Causal Effect of Income on Risk Preferences

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Intro.

Finance theory predicts that rational households are expected to allocate their risky assets in a well-diversified portfolio (Markowits, 1952; Rubinstein, 2002).

However, there is a research gap to explore how households' socio-economic characteristics influence risky asset investment behavior.

Research Question

This research aims to explore what socio-economic factors drive household risky asset investment behavior, and take China as an example. In particular, **this research would like to study the causal effect of households' annual income on the households risky investment behavior.**

Data

- 2019 Chinese Household Financial Survey (CHFS) dataset, which explores income and expenditure, social programs and insurance involvement, preferred financial tools, and investment behaviors with socio-demographic (CnOpenData, 2019).
- dataset consists of 17,149 households
- Provide different geo-spatial information across provinces, districts and counties, and villages (neighborhoods) in China

```
      hhid                RB                RS        
 Min.   :2.019e+09   Min.   :0.0000   Min.   :    0  
 1st Qu.:2.019e+09   1st Qu.:0.0000   1st Qu.:    0  
 Median :2.019e+09   Median :0.0000   Median :    0  
 Mean   :2.019e+09   Mean   :0.4757   Mean   : 9131  
 3rd Qu.:2.019e+09   3rd Qu.:1.0000   3rd Qu.:  1000  
 Max.   :2.019e+09   Max.   :1.0000   Max.   :70000019  
   household          lnincome        city.level    
 Min.   :0.0000   Min.   : 0.000   Min.   :1.000  
 1st Qu.:0.0000   1st Qu.: 9.776   1st Qu.:2.000  
 Median :0.0000   Median :10.714   Median :2.000  
 Mean   :0.4067   Mean   :10.433   Mean   :2.214  
 3rd Qu.:1.0000   3rd Qu.:11.290   3rd Qu.:3.000  
 Max.   :1.0000   Max.   :17.910   Max.   :3.000  
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      age           knowledge          edu             risk       
 Min.   : 10.00   Min.   :0.000   Min.   :1.000   Min.   :0.0000  
 1st Qu.: 34.00   1st Qu.:3.000   1st Qu.:3.000   1st Qu.:0.0000  
 Median : 45.00   Median :3.250   Median :4.000   Median :0.0000  
 Mean   : 47.56   Mean   :3.332   Mean   :4.365   Mean   :0.1903  
 3rd Qu.: 62.00   3rd Qu.:4.000   3rd Qu.:6.000   3rd Qu.:0.0000  
 Max.   :101.00   Max.   :4.500   Max.   :9.000   Max.   :1.0000  
```

Variables	Description
hhid	Household ID
RB	RB could see a household's willingness to participate in stocks, bonds, financial derivatives and non-RMB market. Binary variable: If the sum is larger than 0, then RB=1. otherwise RB=0
Age	Age is defined as the median age in the household. Continuous variable: we calculate the median of the age in each household.
Knowledge	Knowledge means the level of a household's financial knowledge. An index using the responses for each household, range from 0 to 4.5.
Education	Education is defined as the highest level of education that one household ever reached. Categorical variable: primary school and below = 1, junior high school =2, senior high school =3, and college and above =4.
Risk	Risk means the household representative's risk preference. Binary variable: setting the responses below 3 equals 1(prefer risk), and answers 3 and above as 0(avoid risk).
Household type	Household type represents where the household is located, urban or rural. Binary variable: set rural type=0, and non-rural type(city) =1.
City level	City level tries to categorize what level of city a household lives in. Categorical variable: level 1 city =1, level 2 city = 2, level 3 city = 3.
income	Income means a household annual income. Continuous variable: sum up all individual values within one household.

Method

3.1 Causal effect identification

To estimate the local average treatment effect (LATE) in a fuzzy regression discontinuity design (RDD).

An arbitrary low-income cutoff, set at 6,450 yuan by The State Council of the People's Republic of China (2023)

3.2 Regression model of the variables

The following six models are considered:

1. $ln(\frac{P(RB=1|D,X,Z)}{P(RB=0|D,X,Z)}) = \beta_0 + \beta_1 D + \beta_2 X,$

Where we do not control for any covariates.

2. $ln(\frac{P(RB=1|D,X,Z)}{P(RB=0|D,X,Z)}) = \beta_0 + \beta_1 D + \beta_2 X + \beta_3 Z,$

where $Z = \{age, knowledge, edu, household, city.level, risk\}$ (full model)

3. $ln(\frac{P(RB=1|D,X,Z)}{P(RB=0|D,X,Z)}) = \beta_0 + \beta_1 D + \beta_2 X + \beta_3 Z,$

Where $Z = \{age, knowledge, edu, household, city.level\}$

4. $ln(\frac{P(RB=1|D,X,Z)}{P(RB=0|D,X,Z)}) = \beta_0 + \beta_1 D + \beta_2 X + \beta_3 Z,$

Where $Z = \{knowledge, edu, household\}$

5. $ln(\frac{P(RB=1|D,X,Z)}{P(RB=0|D,X,Z)}) = \beta_0 + \beta_1 D + \sum_{i=1}^{4} \beta_i B_i(X) + \beta_4 Z$

, fitted with B-splines with order 4, Where $Z = \{knowledge, edu, household\}$.

6. $ln(\frac{P(RB=1|D,X,Z)}{P(RB=0|D,X,Z)}) = \beta_0 + \beta_1 D + \beta_2 X + \beta_3 X^2 + \beta_4 Z$

,Where $Z = \{knowledge, edu, household\}$.

Results

Table 2. Model estimates of the logistic regression

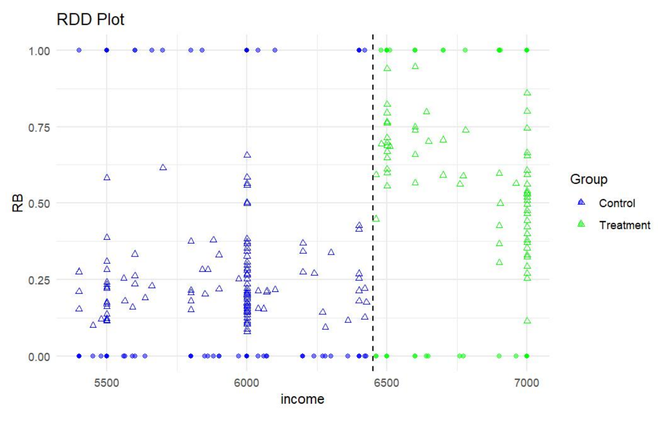
	Model 1:	Model 2:	Model 3:	Model 4:
Treatment(cutoff)	1.813***	1892***	1.896***	1.911***
	(0.582)	(0.590)	(0.602)	(0.598)
Annual income	-0.0005	-0.0004	-0.0004	-0.0004
	(0.0005)	(0.0006)	(0.0006)	(0.0005)
Age of the household		0.002	0.002	
		(0.010)	(0.010)	
Household's type		-0.398	-0.400	-0.400
		(0.401)	(0.400)	(0.400)
Risk preference		0.073		
		(0.795)		
Education level		0.396***	0.396***	0.383***
		(0.128)	(0.128)	(0.111)
Financial knowledge level		0.333*	0.333*	0.332*
		(0.186)	(0.186)	(0.186)
City level		0.017	0.016	
		(0.170)	(0.170)	
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 3. Model estimates of different functional form

	Model 4:	Model 5:			Model 6:	
Treatment(cutoff)	1.911**	1.691*			2.42***	
	(0.598)	(0.936)			(0.676)	
Annual income	-0.0004	1	2	3	1	2
		2.1	-0.6	2.6	-7.442	-4.826*
	(0.0005)	(2)	(1.2)	(2.2)	(5.5)	(2.6)
Age of the household						
Household's type	-0.400	-0.453			-0.462	
	(0.400)	(0.407)			(0.406)	
Risk preference						
Education level	0.383**	0.382***			0.390***	
	(0.111)	(0.112)			(0.112)	
Financial knowledge level	0.332*	0.331*			0.349*	
	(0.186)	(0.189)			(0.187)	
City level						
Note:	*p<0.1; **p<0.05; ***p<0.01;"1,2,3,4" is the order of corresponding functional form					

Table 4. Model estimates of alternative bandwidth

	Narrow:		middle:		Wider:	
Treatment(cutoff)	2.440***		2.872***		3.149***	
	(0.946)		(0.634)		(0.509)	
Annual income	1	2	1	2	1	2
	-1.74	-2.79	-16.2***	-12.1***	-32.5***	-22.6***
	(4.80)	(2.6)	(6.01)	(2.98)	(7.31)	(3.76)
Age of the household						
Household's type	-0.088		-0.370		0.726***	
	(0.450)		(0.390)		(0.133)	
Risk preference						
Education level	0.282*		0.416***		0.482***	
	(0.145)		(0.110)		(0.035)	
Financial knowledge level	0.496**		0.334***		0.459***	
	(0.238)		(0.181)		(0.079)	
City level						
Note:	*p<0.1; **p<0.05; ***p<0.01;"1,2,3,4" is the order of corresponding functional form					



Conclusion

5.1 Discussion

- Future research could consider explore how economic fluctuations and public health emergencies(e.g. Covid 19) using 2022 CHFS data influence financial decision-making over the long term.
- Latent variables, such as household expectations of future income, confidence in financial markets, and attitudes toward risk, could be considered in the future research.

5.2 Limitation

- The sample may not fully represent all households' situations in China, thus limiting the external validity.
- key macroeconomic indicators, such as GDP and interest rates, were not included in this study.

Reference

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