Statistical Measurement of Impact and Risk of Household Financial Investments and Avoidance

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Abstract. The rapid development of the market economy has not only promoted the development of the market of goods, labor, technology, and property rights in China but also promoted the development of the financial market and improved the financial mechanism, thus turning financial investment into a major component of the national economy and social relations. Among them, household investment plays a crucial role in this object as a source of various financial loans. However, due to the impact of the financial crisis and other factors, household financial investments are subject to high risks and a series of problems, which, in addition to the outbreak of the global financial crisis, have led to more and more serious problems in household financial investments, thus increasing the investment risks of investors. Based on this, the analysis of household financial investment and its risk avoidance measures during the financial crisis is carried out in this paper.

Keywords: Statistics, Risk, Household financial investment, risk avoidance

1 Introduction

After financial economist Campbell introduced the concept of family finance in 2006[5], more scholars have turned their attention to it. The existence of risk is a common concern for every family, so many scholars have conducted a series of studies on this subject, mainly focusing on the risk measurement of household financial investment and the optimisation of the structure of the household financial investment.

The development of our capital market is not as mature as that of developed Western countries. There are still major problems: irrationality of investors, lack of financial supervision, malicious manipulation of stocks by listed companies, etc. As a result, our residents are exposed to great risks when carrying out investment activities. Therefore, we need to focus on analysing the ways in which investors' risk attitudes influence investment decisions, so as to guide investors to investors to allocate their capital in a rational manner in order to obtain a portfolio of maximum utility and achieve diversification. There are also many other factors that may influence the allocation of financial assets in a portfolio, and a deeper understanding of investors' strategies for portfolio allocation is essential for developing our capital markets. A better understanding of investors' portfolio allocation strategies is an urgent requirement for the development of our capital markets.

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2 Portfolio Theory

Portfolio theory provides an important theoretical basis for hedging household financial investment risk by restructuring the household's financial investments.

Traditional portfolio thinking holds that diversification is effective in reducing risk and that the greater the range of investment products, the lower the corresponding level of risk. However, the nature of investment is to choose between uncertain returns and risks, and the need to balance these two indicators in asset allocation is a pressing issue for market investors. At the time, traditional portfolio theory was mainly based on estimating returns to forecast the future movements of stocks, with little attention paid to whether there was some sort of correlation between stocks. It was against this background that the American economist Markowitz first used quantitative methods to create portfolio theory in 1952. Based on the assumption that stock prices are unpredictable, Markowitz used variance as a measure of investment risk and suggested that investments should be diversified, which could reduce investment risk to a certain extent. However, it is not the case that the more investments one has, the less risk one has.

Many scholars have used risk aversion coefficients to quantify risk attitudes, using them to describe the current state of investors' risk attitudes in different countries. Early studies by Friend and Blume [2] found that risk aversion coefficients were generally greater than 2. Pindyck [3] used an empirical analysis of asset pricing models to measure risk aversion coefficients in the range of 1.6-5.3. Alessandro and Raffaele [4] used data on US consumer finances in 2004 to calculate a median risk aversion coefficient of about 2.70. Different scholars have come up with different risk aversion coefficients based on different data and models, and there is no uniform conclusion.

3 Factors affecting household financial investment risk

3.1 Limited and homogenous household income structure

When families in China invest in the financial market, the first problem to be solved is the source of funds, and the source of income of families is different from enterprises or financial institutions, the structure is relatively single, usually from wage income, agricultural farming income or other relying on their own labour to obtain a certain amount of income, and this part of the income usually cannot be used to invest all, need to meet the daily expenses of the family on the basis of The household needs to choose a certain amount of surplus income for financial investment according to its own ability and risk appetite. The income structure of China's residents is pyramid-shaped, with only a few households possessing a large amount of social wealth, so the majority of households have limited funds at their disposal, which leads to some households being limited by the amount of funds they have and can only invest in financial projects with lower thresholds and lower returns, while some households disregard their own actual situation and blindly pursue high-yield and high-risk projects in the financial market with a small amount[1].

3.2 Fewer financial investment channels and an imperfect financial system

Nowadays, residents in China mainly invest their household financial assets in the form of bank deposits and bonds, but most investors are stagnant because of the high risks associated with most investment products. In addition, the lack of access to financial investment options in China has limited residents' understanding of the advantages and disadvantages of different types of financial products and investment portfolios, which not only limits their investment choices but also makes it difficult to regulate their own investment behaviour. In addition, the lack of access to investment options also has an impact on the quality and returns of household investments[6].

4 Analysis of the current state of application of portfolio theory

4.1 Probit Model

The probit model will be used to study the effect of risk attitudes on whether households enter the stock market or not (1).

$$y_i^* = x_i\beta + u_i^* \tag{1}$$

y_i^* is the unobservable latent variable and x_i is the explanatory variable. The dummy variable that can be observed is y_i, which satisfies the following relationship (2).

$$y_i = \begin{cases} 1, y_i^* > 0 \\ 0, y_i^* \leq 0 \end{cases} \tag{2}$$

4.2 Tobit Model

The tobit model will be used to study the effect of risk attitudes on household access to equity markets and the proportion of risky financial markets (3).

$$y_i^* = x_i\beta + u_i^* \tag{3}$$

y_i^* is the unobservable latent variable and x_i is the explanatory variable. The dummy variable that can be observed is y_i, which satisfies the following relationship (4).

$$y_i = \begin{cases} y_i^*, y_i^* > 0 \\ 0, y_i^* \leq 0 \end{cases} \tag{4}$$

4.3 Mlogit Model

The mlogit model is used to study the effect of household risk attitudes on the type of household financial asset allocation. The mlogi model is mostly used when the explanatory variable is a multivariate discrete variable, and the model is used to satisfy the condition that there is no sequential relationship between the options that generate utility. In this paper, using the type of household financial asset allocation as the explanatory variable, the condition that there is no sequential relationship of utility between the options is satisfied, i.e. whether the household holds one or two financial assets, there is no sequential relationship of utility. In the mlogit model, if the explanatory variable has M+1 options, the regression will have M equations, each

of which is a binary logit regression relative to the control group equation, and these logit regressions are all conducted at the same time in the mlogit model[8].

If decision-maker i selects the mth option from M+1 available options, then the utility model of the decision-maker is (5)(6)

$$U_{im} = X_{im}B + \varepsilon_{im} \tag{5}$$

$$P(U_{im} > U_{ik}) = P(y_i = m) = \frac{e^{X_{im}B}}{\sum_{m=0}^{M} e^{X_{im}B}} \tag{6}$$

4.4 Probit model regression analysis

This paper adopts a multiple regression approach to describe the relationship between the influencing factors in investors' basic information and risk attitude. According to the statistical results, risk attitude scores are significantly correlated with investors' gender, education level, average monthly household income, years of investment, risky assets ratio and city. Therefore, this paper chooses to apply the Probit model to investigate the relationship between risk attitude and each relevant influencing factor. The following results were obtained by regressing the risk attitude score as the dependent variable and individual characteristics as the explanatory variable.

Table 1. The regression analysis of individual characteristics on risk attitude.

Predictor	B	Standard error	Beta(β)	t-value	Significance
Constants	10.231	0.937		11.834	0.000
Gender	0.671	0.367	0.147	2.873	0.007
Education level	0.356	0.268	0.076	1.762	0.100
Average monthly household income	0.219	0.198	0.145	2.475	0.035
Year of investment	0.63	0.182	0.231	3.700	0.001
Percentage of assets at risk	0.309	0.124	0.179	2.467	0.006
City of residence	0.411	0.174	0.087	1.384	0.056
R=0.554 R^2=0.307 After adjustment R^2= 0.294 F= 13.726 a. Dependent variable: risk attitude score b. Explanatory variables: (constant), gender, education level, years of investment, average monthly household income, the proportion of risky assets, city of residence					

Table 1 shows the regression coefficients of the regression model and their significance tests. The higher the absolute value of the standardised regression coefficient (β), the greater the effect of the explanatory variable on the risk attitude score. The adjusted R-squared is 0.294, indicating that the six independent variables explain a total of 28.1% of the variance in the 'risk attitude score' variable, and their standardised regression coefficients indicate that they are all positively correlated with the risk attitude score. Their standardised regression coefficients indicate that they are positively correlated with risk attitude scores. Secondly, the t-values of the significance tests for the six independent variables were 2.8732 ($p = 0.008 < 0.05$), 1.762 ($p = 0.100 > 0.05$), 2.475 ($p = 0.023 < 0.05$), 3.700 ($p = 0.001 < 0.05$), 2.4679 ($p = 0.007 < 0.05$), and 1.387 ($p = 0.066 > 0.05$) respectively. In the regression analysis, the explanatory variables that do not reach

the significant level do not necessarily mean that there is no relationship with the risk attitude score. In the regression analysis, the explanatory variables that do not reach the significant level do not necessarily mean that they are not related to the risk attitude scores.

Assuming that the explanatory variables of gender, education level, average monthly household income, years of investment, risky assets, and city are represented by Male, Education, Income, Span_invest, Risk_invest, and City respectively, and the risk attitude score is Risk Attitude, then from the above summary table of coefficients The unstandardised regression equation can be derived as follows:

$$Risk\ Attitude = 10.875 + 0.792 \times Male + 0.327 \times Education + 0.242 \times Income + 0.540 \times Span_{invest} + 0.395 \times Risk_{invest} + 0.344 \times City \quad (7)$$

The standardised regression coefficients are usually used in regression equations to estimate the predicted value of a sample, but they contain constant terms that do not allow for comparison of the relative importance of the predictor variables. The standardised coefficient β, on the other hand, can be used as a comparison of the degree of explanatory power between variables because unit effects have been removed. The original regression equation is usually converted into a standardised regression equation, which is as follows:

$$Risk\ Attitude = 0.136 \times Male + 0.085 \times Education + 0.124 \times Income + 0.204 \times Span_{invest} + 0.160 \times Risk_{invest} + 0.098 \times City \quad (8)$$

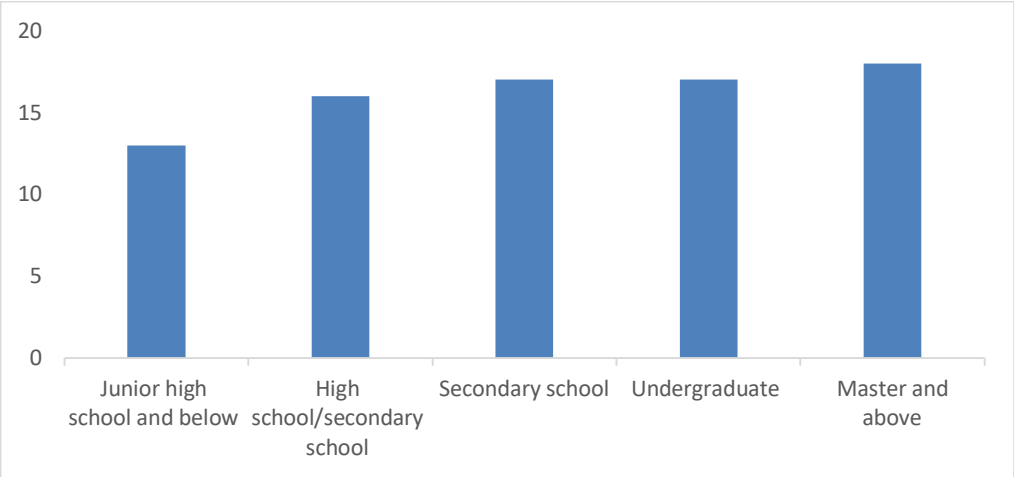

Fig. 1. Average risk attitude scores for groups with different levels of education.

The results shown in Figure 1 indicate that participants with different levels of education exhibit varying average scores in risk attitudes. Specifically, the risk attitude scores increase as the level of education rises, with participants holding at least a college degree displaying a stronger preference for risk. On the contrary, investors with lower levels of education demonstrate a significantly higher aversion to risk in Fig1.

This may be attributed to the fact that investors with higher levels of education possess a deeper understanding of financial knowledge. They anticipate higher future income, which increases their likelihood of participating in the financial market. Additionally, they allocate a more

significant proportion of their investments to risky assets. Moreover, investors with higher levels of education exhibit better risk control abilities and are more inclined to engage in risk investment activities.

The level of education is shown in Table1. The standardised regression equation shows that gender, education level, average monthly household income, number of years invested, percentage of risky assets and city of residence are all positively associated with risk attitude scores[7]. The four explanatory variables in the regression model - gender, average monthly household income, number of years invested and proportion of assets at risk - have a significant effect on the risk attitude score, and their standardised coefficients (β values) are large, indicating that these independent variables have a greater impact on the risk attitude score. The regression coefficients for both education level and city of residence did not reach significance, indicating that these two variables explained less variance in the risk attitude score variable.

5 Conclusion

In summary, investors' risk attitudes are generally influenced to some extent by gender, age, education level, occupation, average monthly household income, number of years invested, proportion of risky assets and city of residence. Overall, risk attitudes were statistically significantly correlated with gender, education level, average monthly household income, years of investment, risky assets and city, except for age and occupation, which were not statistically significantly correlated with risk attitudes. However, in actual combat, we also discovered some flaws in the previous works. We strive to find a model that matches Chinese households in the investment financial market, but find that the parameters related to gender, education level, investment years, etc. is not comprehensive enough. And there is no exact positive or negative correlation explanation in previous hypothesis. In order to effectively implement the model, it is inevitable to overcome the above difficulties first. We consider using econometric models to observe whether the parameters in the model are significant. This article chooses the Probit model and obtains a set of parameters suitable for the Chinese financial investment market through regression analysis of individual characteristics on risk attitude. The regression equation is used to quantify risk attitude. The purpose is to align the model with China's national conditions and make localized models more targeted. This not only solves the problem of parameter visualization in relevant models but also provides strong evidence for future research on China's asset risk investment problems.

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