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Investors' Heterogeneous Preferences for Structured Financial Products in China: The Impact of Demographic Characteristics

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Abstract

Purpose – Structured financial products (SPs) have become very popular with retail investors in recent years. Investors' preferences play a critical role when investing in SPs. The objective of this study is to understand SP investment behavior by investigating Chinese investors' heterogeneous preferences for choosing wealth management products (WMPs) with certain attributes.

Theoretical framework – Investors with different demographic characteristics show different preferences in their SP investments.

Design/methodology/approach – We employ the choice experiment (CE) method and examine preference heterogeneity using the multinomial logit (MNL) and the mixed logit (MXL) models.

Findings – (i) The attributes of small bank, minimum amount, non-guaranteed floating return and guaranteed floating return significantly affect the choice when purchasing WMPs. (ii) There are significant heterogeneous preferences for minimum amount. (iii) These four characters are the sources of heterogeneous preferences for minimum amount.

Practical & social implications of research – This information can contribute to understanding the heterogeneous preferences of investors, which can help in designing marketable WMPs to target different kinds of investors.

Originality/value – The main contribution of the research is it examines investors' heterogeneous preferences for SPs. The study provides empirical evidence of which attributes of structured products significantly affect investor preferences. It also reveals which characteristics of investors affect their heterogeneous preferences.

Keywords: Structured financial products, heterogeneous preferences, choice experiments, mixed logit model, behavior.

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1 Introduction

Structured financial products (SPs) are a class of financial products that pay on maturity a return that depends in a predefined way on the trajectory of one or more underlying assets (Rieger, 2012). In recent years, SPs have become very popular with retail investors, especially in Europe and East Asia. In China, the most popular type of SP are wealth management products (WMPs). WMPs are investment vehicles marketed to retail and corporate investors, which are sold by both banks and non-bank financial institutions (NBFIs), sometimes with explicit principal or interest guarantees (Perry and Weltewitz, 2015). WMPs are a type of SP that can be constructed by combining a call option with a fixed interest investment. They have some of the characteristics of structured investment vehicles (SIVs) as well as collateralized debt obligations (CDOs), which were used by U.S. banks before 2008 to keep loans off balance sheets (Chancellor and Monnelly, 2013). This paper takes WMPs as the object of study and analyzes the investment behavior of investors in SPs.

Wealth management products in China have shown significant growth. Before 2016, the growth rate in the issuance of WMPs was rapid, with the annual average growth rate remaining at about 50%. In 2016 and 2017, the growth rate decreased but the estimated outstanding stock exceeded 29 trillion CNY (about 4.2 trillion USD) (China Banking Wealth Management Registration & Depository Center, 2018). The reason for the rapid growth is that WMPs can offer advantages to both banks and investors.

For investors, WMPs provide access to investments where returns significantly exceed regulated deposit rates. For banks, WMPs provide funding sources that allows them to compete for capital, while keeping the WMPs off their balance sheets and avoiding regulatory requirements.

But now, banks face a new situation where the WMP growth rate is not as high as in previous years. Thus, the probability of attracting more money flows by retailing more WMPs is decreasing. Lower growth rates create more competition between banks. If a bank retails more WMPs, the other banks' retailing becomes lower. To be viable, financial products must appeal to a sufficiently large clientele and WMPs need to satisfy customers' preferences (Allen & Gale, 1988; Mada & Soubra, 1991; Shefrin & Statman, 1993).

Numerous scholars have studied the pricing of SPs in different markets. Henderson and Pearson (2011) analyzed the products from the U.S. market. Stoimenov and Wilkens (2005) assessed the products from the German market, while Wallmeier and Diethelm (2009) studied the Swiss market. All of these authors found that the SPs were overpriced at the time of issuance. Investing in such products is a bad idea but it nevertheless remains very popular (Rieger, 2012). Henderson and Pearson (2011) call this phenomenon the dark side of financial innovation.

In fact, in a standard model of portfolio choice, securities with expected returns that are lower than the riskless rate are rationally purchased by investors only if their returns covary positively with the investor's marginal utility (Merton, 1982). Nevertheless, investors continue to buy the overpriced SPs. Hence, understanding SP buying behavior is an important topic of inquiry.

The objective of this study is to understand SP investment behavior by investigating Chinese investors' heterogeneous preferences for choosing WMPs with certain attributes. Specifically, we employ the choice experiment (CE) method and examine preference heterogeneity by using the multinomial logit (MNL) and the mixed logit (MXL) models. This study contributes to the existing literature by examining investors' heterogeneous preferences for SPs using the CE method. In doing so, we provide empirical evidence on which attributes of structured products significantly affect investor preferences. We also reveal which investor characteristics affect their heterogeneous preferences.

Our paper is organized as follows. Section 2 reviews the existing literature on SP buying behavior. In Section 3, we summarize the CE method and the research, MNL, and MXL models. We also propose three hypotheses to be tested. Section 4 outlines the CE survey used to ascertain investors' preferences, and we describe the MNL and MXL models used to analyze the data obtained from the CE survey. Section 5 concludes and offers suggestions for further study.

2 Literature review

Most existing studies outline the buying behavior for other financial products, but not SPs. Sahi et al. (2012) identified three factors that influence investor preferences, namely demographic, socio-economic, and psychographic variables. Psychographic variables are the most important predictors for higher risk investment

products, and demographic and socio-economic variables are the most important predictors for lower risk products.

Numerous scholars have also focused on the reasons for buying SPs. Some studies focus on irrational decision-making and behavioral biases. Ofir and Wiener (2016) argue that retail investors that favor SP investments tend to be affected by behavioral biases, including loss aversion, disposition effects, herd behavior, the ostrich effect, and hindsight bias. Henderson and Pearson (2011) provide an uncomplicated analysis of investor misunderstanding of financial markets. The authors outline the cognitive biases in evaluating probabilistic information, as well as the framing effects. Rieger (2012) found that behavioral biases increase the subjective attractiveness of SPs.

Many other studies attribute SP attractiveness to the demographic characteristics of investors. Döbeli and Vanini (2010) controlled for gender differences in SP investments. Chang et al. (2010) found that individual financial literacy, education, and IQ are statistically significant explanatory variables, and that investors that were more financially literate formed reasonable expectations about stocks and bought less. Yang (2013) revealed that investors' decision making is affected by their confidence and information gathering abilities, which are significantly influenced by income, age, and gender.

Other studies consider external factors. Döbeli and Vanini (2010) found that when a structured product is described with simple words it strongly motivates people to invest in the product for the first time. Schroff (2015) revealed that the informational efficiency of retail investor trading in structured products is limited and that their trading behavior exhibits various behavioral biases.

Another stream of literature emphasizes the attributes of products as the elements influencing investor behavior. Abreu and Mendes (2018) provide evidence for investor preferences for SPs, which allow investors to access segments otherwise not available to them. Jørgensen et al. (2011) argue that there are hidden costs that are not disclosed to investors and thereby affect their decisions. The attributes of the products can also influence the preference for one kind of SP over another. Jørgensen et al. (2011) found that the factors contributing to the hidden costs are related to the products' time to maturity, arranger and issuer size, and complexity, which are the main determinants of product costs and the degree of overpricing. Choosing between alternatives is a process by which customers collect and evaluate relevant information regarding products' attributes according to their preferences (Hawkins and Mothersbaugh, 2010). The preferences for the attributes of SPs are very intuitive and critical in understanding SP investment behavior, so they deserve more research. This study contributes to the existing literature by identifying the attributes influencing investors' preferences. We specifically analyzed heterogeneous investors' preferences for these attributes, combined with the demographic characteristics of investors.

Because some attributes of SPs make the product look more attractive, investors prefer them because they receive high utility, which will change their terminal wealth. Many scholars draw on utilitarian thought to study investment behavior. Breuer and Perst (2007) drew on expected utility theory to study the demand for SPs, while Hens and Rieger (2014) used prospect theory. Bernard, Boyle, and Tian (2007) studied the characteristics of optimal capital-protected products for various investor preferences. Döbeli and Vanini (2010) used the utility function to analyze investment preferences. Therefore, we can also study investors' preference for WMPs from the perspective of investor utility.

Methodologically, preceding studies have mainly used three methods to collect data on SP investors' behavior. These include questionnaires (Döbeli and Vanini, 2010; Yang, 2010), real market data (Abreu and Mendes, 2018; Henderson & Pearson 2011; Jørgensen et al., 2011), and experiments (Rieger, 2012; Ofir & Wiener, 2016). Our study combines discrete choice models with the choice experiment (CE) approach to analyze preferences when investors purchase WMPs, a kind of SP. These CEs are consistent with Lancaster's theory of utility maximization (Lancaster, 1966), and with the discrete choice modeling developed by McFadden (1973). Lancaster (1966) proposed that a good in itself does not provide utility to the consumer. Rather, a good possesses characteristics, and these characteristics give rise to utility. Following Lancaster and McFadden, CEs are widely used to elicit consumer valuations of non-market goods and marketable goods with novel attributes or characteristics. Similarly, an investment instrument possesses characteristics, and these characteristics give rise to utility, which will change the terminal wealth of the investor. Thus, the CE method is suitable for conducting research on investors' behavior. However, few studies exist about the application of this method to investors' behavior. Our study seeks to contribute to the literature on SP market forecasting through the application of the CE method in analyzing investor's preferences and behavior.

3 Methods

3.1 Research methods

Choice experiments closely simulate real-world purchasing decisions, where a respondent has to select a product from a set of options. We use CEs to elicit investors' preferences for WMPs with certain attributes that can have a large impact on their choice decisions. We identified the following four attributes for the WMPs in constructing the choice sets: bank, term, minimum amount, and type. "Bank" is the issuer. "Term" is the time to maturity of the WMPs. "Minimum amount" is the threshold to purchase a certain kind of WMP. "Type" means the return type of the WMPs. Table 1 describes these attributes and how each level of attribute is defined. To make the alternatives more realistic, we used the names of three real banks, namely the Industrial and Commercial Bank of China (ICBC), CITIC Bank (CITIC), and Bank of Weifang, to represent the three levels of the bank attribute.

The four attributes have the levels 3, 4, 4, and 3, respectively, for a total combination of 144 ($3^2 \times 4^2$) choice sets. However, because too many choice sets may hinder the consumers' ability to make more rational decisions in a short time (Gao et al., 2010), a full factorial design encompassing all possible combinations of attribute levels would not be feasible. For that reason, we selected a subset of these choices by employing the orthogonal main effects design, which can adhere to CE design principles to maximize design efficiency. This includes displaying i) orthogonality, which ensures that differences in the levels of each attribute vary independently over choice sets, and ii) balance, to confirm that all levels appear with equal frequency in the questionnaire (Johnson et al., 2013). We implemented the orthogonal main effects design using SAS 9.4. As a result, we obtained 11 choice sets. Every choice set includes two alternative preference options and one option for neither if the respondent does not prefer either of the two alternative preferences. Table 2 presents an example of the choice set that was used. Each respondent was presented with 11 choice sets and was asked to choose one of three options: alternative 1, alternative 2, or neither. 'Neither' is an opt-out option, which was presented to match the real-life decision context.

In addition, in the WMP market, issuers disclose information on expected yields to maturity (YTM) as a reference. But the fluctuations of real YTM are an uncertainty in the market, and issuers also state the benchmark return, but not the guaranteed return rate. In order to reflect the real market, we added expected yields to maturity as a reference for the respondents. Because four attributes are correlated with risk, we set the expected YTM as an item reflecting the difference of risks based on the difference of attributes rather than as the independent attribute.

Table 1
Descriptions and levels of the chosen attributes

Attribute	Description	Levels	Expected Sign
Bank	WMPs have financial risks. Different banks use different investment portfolios and types of WMPs. The differences are directly reflected in the performance of financial products.	Level 1: Large bank	base
		Level 2: Medium bank	-
		Level 3: Small bank	-
Minimum amount	This is the threshold to purchase a bank's WMPs. Generally, WMPs with a higher initial purchase amount have a higher yield. (Unit: 10 thousand RMB)	Level 1: 5	-
		Level 2: 10	
		Level 3: 50	
		Level 4: 100	
Term	This is the duration until maturity of WMPs, which directly affects the yield on maturity. (Unit: days)	Level 1: 64	-
		Level 2: 93	
		Level 3: 185	
		Level 4: 365	
Type	The return type of WMPs can be divided into fixed return WMPs and floating return WMPs. Floating return WMPs can be divided into guaranteed floating return WMPs and non-guaranteed floating return WMPs.	Level 1: Non-guaranteed floating return	-
		Level 2: Guaranteed floating return	-
		Level 3: Fixed return	base

Table 2
A sample choice set used in this study

Characteristics of WMPs	Option 1	Option 2	Option 3
Bank	Bank of Weifang	ICBC	Neither
Minimum amount	100	10	
Term	185 days	365 days	
Type	Guaranteed floating return	Non-guaranteed floating return	
Yields to maturity	4.7	4.7	

The survey questionnaire comprised two sections. The first part asked about the personal characteristics of the respondents, such as income, age, gender, and education, to analyze the effect of characteristics on preferences. The second part contained questions for the CE analysis that were designed to record the respondents' preferences for choosing WMPs.

The survey was carried out in Weifang, China, from April 13 to 19, 2018. Weifang is a medium-sized city with an urban population of 1.28 million. It is representative of a medium-sized city in China. A total of 156 people participated in the survey.

3.2 Hypotheses

As we pointed out earlier, numerous studies have analyzed the effects of SP attributes on investors' behavior from the perspective of the financial products themselves. For example, Abreu and Mendes (2018) argue that the reason why investors show a preference for SPs is that they allow investors to access segments. However, these characteristics are not intuitive enough and they are not convenient for investors to compare. In this study, we selected four obvious and intuitive attributes to study, which we believe are likely to affect investors' behavior.

According to Yang (2013), investors' ability to gather information influences their decision-making regarding investment preferences. The attributes of SPs can intuitively show information describing the financial products. Döbeli and Vanini (2010) found that a product described in simple words strongly motivates people to invest in SPs for the first time. Descriptions of SP attributes can intuitively show more information to investors. Thus, our first hypothesis is as follows:

> H_1: the attributes of SPs can influence investors' behavior.

Among the four attributes selected in this study, "minimum amount" and "term" are numerical variables, so their exact value can be used directly for the regression. "Minimum amount" is the threshold to purchase certain kinds of WMPs. Usually, a higher threshold keeps smaller investors out. Therefore, we propose that the "minimum amount" attribute can negatively influence investors' preferences (H_{1a}).

"Term" is the duration until maturity of WMPs, which will affect the yields. According to liquidity premium theory (Mishkin, 2015), a term premium typically rises with maturity in the bond market. But in the SP market, Henderson and Pearson (2011) found that the premium shows a slow decay within 140 days and a modest increase after 140 days. "Term" can show information about yield and risk. From the perspective of risk aversion, we propose that this attribute can negatively influence the investors' preferences (H_{1b}).

"Bank" and "type" are the categorical variables and they each have three levels. We employed dummy coding to obtain six dummy variables: "large bank," "medium bank," "small bank," "non-guaranteed floating return," "guaranteed floating return," and "fixed return."

"Type" refers to the return type of the WMP (i.e., floating return or fixed return) and intuitively shows the risk associated with WMPs. We set "fixed return" as the base, according to the risk aversion of investors, and we propose that the attribute "non-guaranteed floating return" and "guaranteed floating return" can negatively influence investors' preferences (H_{1c}, H_{1d}).

"Bank" shows the issuer size, implying the information about brand and risk. We set "large bank" as the base, again according to the risk aversion of investors. We propose that the "medium bank" and "small bank" attributes can negatively influence the investors' preferences (H_{1e}, H_{1f}).

Investors' preferences may be either homogeneous or heterogeneous. Heterogeneous preferences mean that different types of investors show different preferences, which has been researched in many studies. For example, Yang (2013) analyzed the heterogeneous types of investors based on their income, gender, and maturity, etc. Döbeli

and Vanini (2010) also controlled for gender differences in investment behavior. We propose the following second hypothesis H2 to test whether investors' preferences for the four attributes of SPs are heterogeneous.

H2: Investors' preferences for these four attributes are heterogeneous.

For the categorization of heterogeneous investors, some studies focus on the differences in risk preference and cognitive ability (Coleman, 2003 ; Dorn & Huberman, 2010).

Sadi et al. (2011) confirmed that demographic factors play a significant role in determining the behavior and decisions of investors. Accordingly, some studies have looked at the differences in demographic factors among investors (Mak & Ip, 2017; Yang, 2013).

Correspondingly, we identify whether investors have heterogeneous preferences for some SP attributes based on the test results for H2. Then, we propose the following third hypothesis to test whether the demographic characteristics are the predictors of preference heterogeneity, which can explain the transmission mechanism of heterogeneous preferences.

H3: Demographic factors are the predictors of heterogeneous preferences for SP attributes.

If a certain attribute is the predictor of heterogeneous preference, it shows that heterogeneous investors have different investment behaviors due to their preference for this attribute. In this paper, we tested for seven demographic characteristics, including age, annual family income, education, monthly expenditure, gender, profession, and mortgage or not.

3.3 Research model

The utility function is used to explain individual choices when choosing from the available alternatives. The utility function for each respondent n, who chooses alternative j from the choice set, can be expressed as (Equation 1):

$$U_{nj} = V_{nj} + \varepsilon_{nj} \tag{1}$$

The utility U_{nj} can be decomposed into two parts: the deterministic utility V_{nj}, and the stochastic utility ε_{nj}. The stochastic utility represents the unobservable influence on individual n's choice of alternative j. Therefore, the choice probability can be used to reflect the utility of decision makers. P_{ni} is the probability if individual n selecting alternative j.

$$P_{ni} = Prob\left(U_{ni} > U_{nj}, \forall j \neq i\right) = Prob\left(V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj}, \forall j \neq i\right)$$

$$= Prob\left(\varepsilon_{nj} - \varepsilon_{ni} < V_{ni} - V_{nj}, \forall j \neq i\right) \tag{2}$$

According to the different assumptions of ε_{nj}, Equation 2 can be broken down into different discrete choice models. The multinomial logit model (MNL) is a prevailing model used to estimate respondent preferences in CEs, where ε_{nj} is assumed to have an identical independent Gumbel distribution (McFadden, 1974). The probability of individual n choosing alternative j can be expressed as (Equation 3):

$$P_{ni} = \frac{e^{V_{ni}}}{\sum_{j \in C} e^{V_{nj}}} \tag{3}$$

where $V_{ni} = \beta x_{ni}$, and x_{ni} are the attributes of the alternative i that individual n chooses. We can include four attributes in the utility function to obtain the Equation 4,

$$V_{nj} = ASC + \beta_1 \text{Bank} + \beta_2 \text{Minimumamount} + \beta_3 \text{Term} + \beta_4 \text{Type} \tag{4}$$

where ASC is the alternative-specific constant to model the impact of an opt-out option.

However, the MNL model restrictively assumes that the functional form of utility is common among individuals, including homogenous preferences and independence of irrelevant alternatives (IIA). It does not allow for unobserved preference heterogeneity, which means that β is fixed. That is, it does not reflect the actual situation. In the mixed logit model proposed by McFadden and Train (2000), these assumptions are relaxed and β is assumed to follow a certain distribution. Thus, the probability if individual n choosing alternative j can be expressed as (Equation 5):

$$P_{ni} = \int \left(\frac{e^{V_{ni}}}{\sum_{j \in C} e^{V_{nj}}} \right) f(\beta \mid \theta) d\beta \tag{5}$$

where $f(\beta \mid \theta)$ is the probability density function of β, and θ represents the parameters of the density function.

The parameters of the MXL model can be estimated using maximum simulated likelihood (MSL), as proposed by Train (2009). In order to consider heterogeneous preferences, we employed the MXL model to derive the utility function as

$$V_{nj} = ASC + (\beta_1 + \sigma)X_1 + \beta_2 X_2 \quad (6)$$

where X_1 are some attributes set as random parameters, and X_2 are some attributes set as fixed parameters.

To determine the reason for the heterogeneous preferences, we can add cross items to test the interaction effect among the characteristics of the respondents and their preferences:

$$\begin{aligned} V_{nj} = {} & ASC + \beta_1 Bank + \beta_2 Minimumamount + \beta_3 Term + \\ & \beta_4 Type + \beta_5 attribute * gender + \beta_6 attribute * age + \\ & \beta_7 attribute * profession + \beta_8 attribute * familyrevenue + \\ & \beta_9 attribute * education + \beta_{10} attribute * \exp enditurepermonth + \\ & \beta_{11} attribute * mortgage \end{aligned} \quad (7)$$

where *attribute* is one of the four attributes. We test them when they are significant as the random parameters.

4 Data and analysis

In the questionnaire, the first part contained questions about respondent characteristics, which included the seven variables presented in Table 3. The table also includes the mean and standard deviation for each variable. 50.64% of the survey respondents were males. The mean age was 3.44, which means that the average age is an interval between the ages of 26 and 40. The mean annual family income was 3.05, where the average annual family income was between 50 and 100 thousand RMB. The mean education was 3.4, indicating an average educational level between a junior college degree and an undergraduate degree. The average expenditure per month was between 1000 and 5000 RMB. Also, 42.3% of the respondents still had a mortgage.

The objective of this study is to evaluate the effect of the respondent characteristics on their attribute preferences, which we estimated through Equation 6. Before that, we estimated the MNL model and the MXL model. In the regression analysis, we used the exact numerical value of the numerical attribute variables, such as "minimum amount" and "term." Categorical variables, however, were coded using dummy coding. We included three dummy variables according to the attributes "bank" and "type," respectively. In order to avoid multicollinearity, we chose "large bank" as the base category for "bank" and selected "fixed return" as the base category of "type."

4.1 Regression results of the MNL model

First, we estimated the MNL model to investigate investors' preferences for certain attributes. The results are presented in Table 4, which shows the coefficients of four attributes affecting the respondents' choice, and the significance of the coefficients. Significance levels were determined using the t-test, where one star represents the 10% level, two stars the 5% level, and three stars the 1% level.

It is apparent from Table 4 that the coefficients of "small bank," "minimum amount," "non-guaranteed floating return," and "ASC" (alternative-specific constant) are statistically significant at the 1% level. The coefficient for "guaranteed floating return" is statistically significant at the 10% level, while the coefficients for "medium bank" and "term" are not statistically significant. The results

Table 3
Characteristic variables and survey results summary

Characteristic Variable	Assignment	Mean	Standard Deviation
Gender	0=female;1=male	0.506	0.502
Age	1=under 18; 2=18~25; 3=26~30; 4=31~40; 5=41~50; 6=51~60; 7=above 60	3.442	1.171
Profession	1=student; 2=governor; 3=worker; 4=seller; 5=financial officer; 6=manager; 7=technical staff; 8=teacher; 9=counsellor; 10=financial staff; 11=others; 12=retired	6.462	3.883
Family annual revenue	1=under 20K; 2=20-50K; 3=50-100K; 4=100-200K; 5=200-500K; 6=More than 500K	3.051	1.598
Education	1=less than middle school; 2=high school or technical secondary school; 3=some college; 4=undergraduate; 5=graduate	3.397	1.216
Expenditure per month	1=0-1000RMB;2=1001-3000 RMB;3=3001-5000 RMB;4=5001-8000 RMB;5=8001-15000 RMB;6=above 15000 RMB	2.436	1.364
Mortgage	1=Yes;0=No	0.423	0.496

Table 4
Estimated MNL results of the preference for attributes

Variable	Coefficient	Standard Error
Bank: Medium Bank	-0.002	0.102
Bank: Small Bank	0.280***	0.098
Minimum Amount	-0.007***	0.001
Term	-0.000	0.000
Type: Non-guaranteed Floating Return	-0.338***	0.106
Type: Guaranteed Floating Return	-0.1774*	0.104
ASC	0.5889***	0.158
Adjusted Estrella R^2	0.228	
McFadden LRI R^2	0.115	
Likelihood Ratio	433.5	

Note: ***, **, and * represent the 0.01, 0.05, and 0.1 levels of statistical significance, respectively.

indicate that the "small bank," "minimum amount," "non-guaranteed floating return," and "guaranteed floating return" attributes significantly affect the respondents' choice to purchase the WMPs.

The results also show how attributes affect respondents' preferences when they buy WMPs. The effect of "small bank" on the preference for the WMPs was positive, meaning that this factor negatively influences investors' behavior. Thus, H_{1f} is not confirmed. In contrast, it is positive. Ofir and Wiener (2016) argued that issuing banks with competitive advantages raise their profit margins, so small banks can increase market competition to enlarge the consumer surplus. Therefore, investors prefer purchasing WMPs from smaller banks rather than from larger ones. The coefficient for "medium bank" was insignificant, meaning that investors do not have an obvious preference for medium banks. As such, the influence of a medium bank size on investors' behavior (H_{1e}) cannot be confirmed.

The effect of "minimum amount" on investors' preference for WMPs was negative, meaning that "minimum amount" has a negative influence on investors' behavior. Thus, H_{1a} is confirmed. This suggests that investors are more likely to buy WMPs with a lower threshold. Few studies have focused on the influence of the purchase amount threshold on investors' behavior. However, some studies focusing on the influence of the free-shipping threshold on purchase behavior found that it had a significant influence on purchase quantity (Becerril-Arreola et al., 2013; Zhou et al., 2009). Their findings can support our result to a certain extent. At the same time, the effect is slight because the coefficient (-0.007) is small. This means that the threshold can have an evident impact only when it is adjusted to be very large.

The coefficient for "term" is also insignificant, meaning that investors' preference for time to maturity is not obvious. As such, the influence of "term" on investors' behavior (H_{1b}) cannot be confirmed. A similar conclusion was obtained by Henderson and Pearson (2011), who found that the premium showed a slow decay within 140 days and a modest increase after 140 days in the SP market.

The effects of "non-guaranteed floating return" and "guaranteed floating return" on the preference for WMPs were negative, indicating that both H_{1c} and H_{1d} are confirmed. This means that investors prefer purchasing WMPs with fixed returns instead of floating returns. The probability of purchasing WMPs with non-guaranteed floating returns is lower than that of purchasing WMPs with guaranteed floating returns. This result indicates that investors purchasing WMPs are risk averse and prefer WMPs with lower risks, because their decisions are influenced by the bias of loss aversion (Ofir and Wiener, 2016).

4.2 Regression results of the MXL model

The MNL model imposes restrictive assumptions of IIA on choice behaviors with homogenous preferences. Hence, the MXL model is employed to capture preference heterogeneity. Thus, we estimated a MXL model to investigate the heterogeneous preferences for the different attributes. In the process, we set all attributes as the random parameter variable, which is assumed to follow a normal distribution. Based on the significance levels of random parameters in the results, we kept the significant random parameters and set the insignificant random parameters as fixed parameters. The results obtained are displayed in Table 5. It is obvious that the results estimated with the MXL were better than the ones estimated with the MNL model, according to the increasing levels of goodness-of-fit measured with the adjusted Estrella R^2, the McFadden LRI R^2, and the log likelihood.

In Table 5, we can see that the attributes with statistically significant coefficients are the same as in the results of Table 4. This includes the coefficients for

"small bank," "minimum amount," "non-guaranteed floating return," "guaranteed floating return," and "ASC." Meanwhile, the coefficients of "medium bank" and "term" are not statistically significant. Moreover, the statistically significant attributes have the same direction of influence in Tables 4 and 5. This confirms that the conclusions drawn from the MNL model are robust.

In the MXL model, the "minimum amount" was set as a random parameter variable following a normal distribution. As we can see in Table 5, the mean and standard deviation are both significant at the 1% level, and the minimum amount follows a normal distribution, $Z \sim N\left(-0.014, 0.020^2\right)$. We can draw three conclusions: (1) the "minimum amount" threshold significantly affects the utility level when investors purchase WMPs, and the higher the minimum amount, the smaller the utility; (2) because the results follow a normal distribution $Z \sim N\left(-0.014, 0.020^2\right)$, when the minimum amount increases by one unit (10 thousand RMB), 75.80% of the investors will have a lower probability of choosing the choice set, and 24.20% of the investors will have an increased probability; (3) because "minimum amount" is the random parameter variable following a normal distribution, there are significant heterogeneous preferences for "minimum amount" among all respondents, and there are homogeneous preferences for the other attributes.

Table 5
Estimated MXL results of the preference for attributes

Variable	Coefficient	Standard Error
Random parameter variable		
Minimum Amount _M	-0.014***	0.004
Minimum Amount _S	0.020***	0.007
Fixed parameter variable		
Bank: Medium Bank	0.039	0.110
Bank: Small Bank	0.267**	0.109
Term	-0.000	0.000
Type: Non-guaranteed Floating Return	-0.267**	0.118
Type: Guaranteed Floating Return	-0.221*	0.114
ASC	0.547***	0.166
Adjusted Estrella	0.231	
McFadden LRI	0.116	
Likelihood Ratio	438.14	

Note: ***, **, and * represent the 0.01, 0.05, and 0.1 levels of statistical significance, respectively.

As a result, H2, which postulates that investors' preferences for these four attributes are heterogeneous, is partly confirmed. Only the "minimum amount" attribute is heterogeneous, but the other three attributes are not.

4.3 Regression results of the MXL model with cross items

The conclusion is that there are significant heterogeneous preferences for "minimum amount" among all respondents. This means that different investors have different preferences. We need to recognize the predictors of heterogeneity. Based on Equation 7, we added the cross items to the MXL model. The cross items are combined based on the random parameter and characteristic variables. Table 6 presents the regression results of the MXL model with cross items. According to the increasing levels of goodness-of-fit measured by the adjusted Estrella R^2, the McFadden LRI R^2, and the log likelihood, the estimated results are better.

As Table 6 shows, the attributes with significant and insignificant coefficients are almost the same as the results in Tables 4 and 5. The only difference is that the attribute for "non-guaranteed floating return" is not significant. The random parameter variable is set in the same way as in Table 5, and the mean and standard deviation results are also significant. They all reconfirm that the conclusions drawn from the MNL and MXL models are robust.

The purpose of this section is to recognize the sources of heterogeneity. We therefore proceeded to analyze the cross items in Table 6.

There are seven cross items in Table 6. As we can see, the coefficients of four of the seven items are significant at the 1% or 5% level. These include age, annual family income, education, and monthly expenditure. This means that these four characteristics are the predictors of heterogeneous preference for the "minimum amount" attribute. Investors with differences in terms of age, annual family income, educational level, and monthly expenditure, have different preferences regarding the minimum amount threshold for purchasing WMPs. Therefore, it can be concluded that demographic factors are the predictors of heterogeneous preferences for the SP attributes (H3). The other three characteristics – gender, profession, and mortgage or not – are not significant, which means they are not predictors of heterogeneity.

Table 6
Estimated MXL results with cross items

Variable	Coefficient	Standard Error
Random parameter variable		
Minimum Amount _M	-0.068***	0.028
Minimum Amount _S	0.048***	0.015
Fixed parameter variable		
Bank: Medium Bank	0.136	0.122
Bank: Small Bank	0.266**	0.121
Term	0.000	0.000
Type: Non-guaranteed Floating Return	-0.137	0.133
Type: Guaranteed Floating Return	-0.283**	0.124
ASC	0.415**	0.192
Minimum Amount × gender	0.005	0.005
Minimum Amount × age	-0.008**	0.003
Minimum Amount × profession	-0.000	0.001
Minimum Amount × family annual revenue	0.006**	0.002
Minimum Amount × education	0.015***	0.005
Minimum Amount × expenditure	-0.007**	0.003
Minimum Amount × mortgage	0.004	0.005
Adjusted Estrella	0.273	
McFadden LRI	0.143	
Likelihood Ratio	537.17	

Note: ***, **, and * represent the 0.01, 0.05, and 0.1 levels of statistical significance, respectively.

Based on the "optional life-cycle investing" idea of the life-cycle theory, people take a long position in their human capital, and a short position in their pre-committed consumption stream. If income is pro-cyclical, human capital will be a substitute for cash, and financial investments should involve more bonds and less cash (Munk & Sørensen, 2010; Bick et al., 2013). This means that people prefer to invest in high-risk assets as their labor income increases but prefer to invest in low risk assets when their pre-committed consumption stream increases.

The coefficients associated with minimum amount*age and minimum amount*monthly expenditure are negative, showing that older investors have higher monthly expenditure and a greater preference for WMPs with the lower minimum amount. It is easy to understand that older investors are more cautious. Abreu and Mendes (2018) also found that heavy SP traders are younger. Based on Munk and Sørensen (2010), the proportion of investment in risk assets will decrease as age increases. Therefore, they prefer WMPs with lower thresholds, which are considered to be lower risk.

It is a little complicated to understand why investors with higher monthly expenditure prefer the lower minimum amount. In general, WMPs with a low investment threshold are regarded as low risk. According to the "optional life-cycle investing" theory (Munk & Sørensen, 2010), increased consumption has a negative influence on financial wealth accumulation, and people prefer to invest in low-risk assets. Therefore, the higher the monthly expenditure, the lower the minimum amount preferred.

The other two cross item coefficients associated with minimum amount*education and minimum amount* annual family income are positive. This shows that investors with a higher annual income also have a higher educational level, as well as a greater preference for WMPs with the higher minimum amount, regardless of the purchasing threshold. This finding is consistent with the conclusions of previous studies. According to the "optional life-cycle investing" theory (Munk & Sørensen, 2010), as income rises, human wealth increases, which results in a preference for investing in risky assets. Accordingly, people prefer to invest in high-risk assets as their labor income increases. The authors also showed that college graduates are more likely to invest in the stock market than investors with a lower educational level because their income increases more rapidly and reaches a considerably higher level. Likewise, Dohmen et al. (2010) found that lower cognitive ability is associated with greater risk aversion, and that educational level and family income are positively related to cognitive ability.

In terms of the sensitivity of the estimated interaction coefficients, among the four significant cross items, the absolute value of the coefficient associated with minimum amount*education is the highest. This indicates that investors with different educational levels are most sensitive to the minimum amount, while a different annual family income is the least sensitive to the minimum amount. This implies that, among investors with different household incomes, there are only minor differences in the preferences for WMPs with different investment thresholds.

5 Conclusion

This study examined WMP investors' behavior and investment choices. We examined the factors influencing the choice to purchase WMPs based on four investor demographic characteristics. We draw the following three conclusions:

(1) The attributes "small bank," "minimum amount," "non-guaranteed floating return," and "guaranteed floating return" significantly affect the respondents' choice when purchasing WMPs;

(2) There are significant heterogeneous preferences for "minimum amount" for all respondents, and there are homogeneous preferences for the other attributes;

(3) These four characteristics, age, annual family income, education, and monthly expenditure, are the sources of heterogeneous preferences for the "minimum amount" attribute.

The findings offer some behavioral evidence to banks and the SP market. Banks should take into account the heterogeneous preferences of investors according to their characteristics, which can help in designing marketable WMPs to target different kinds of investors.

As a kind of SP, the findings for WMPs can contribute to understanding the principle of investors' behavior in the SP market.

In our explanation of the sources of heterogeneous preference, we adopted risk aversion as a transmission variable. But in the questionnaire design, we did not take it into account. This limitation requires further study in this area.

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