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A STUDY OF HOUSEHOLD FINANCE IN CHINA

by
HUANG Zhen

A thesis
submitted in partial fulfillment
of the requirements for the Degree of
Doctor of Philosophy in Economics

Lingnan University

2013

ABSTRACT

A Study of Household Finance in China

by

HUANG Zhen

Doctor of Philosophy

The emerging field of household finance, which studies the welfare benefits of financial markets for households and how effectively households use this market, is of significant importance for both academics and policy makers. However, studies in this new field remain scarce. Using data from a national representative survey that is unique for its combination of abundant household characteristics and heterogeneous individual preferences, attitudes and beliefs, and for its inclusion of investment behaviour and performances, this thesis pioneers a positive household finance study in developing countries by systematically investigating Chinese householders' investments in the stock market. Moreover, this is the first study to regard the psychological concept of 'trait anxiety' (which refers to a person's inherent propensity to feel anxious) as negatively associated with stock investment return performance.

This thesis comprises three main studies. In the first study, I investigate the reasons households participate in the stock market. I find that the evidence from China is systematically consistent with previous studies, which mainly focus on developed countries. That is, the poor and the less educated are less likely to hold equity in their final portfolios; and variables reflecting cost, constraint, preference and expectation play a statistically significant role in stock market participation. I also investigate the stock market participation problem from the new perspective of job satisfaction. Discontentment with one's job, especially on job salary motivates stock investment activity. Satisfaction with hours of work and job stability boosts the probability of participation.

Individual investment performance plays an increasingly important role in household wealth accumulation and financial well-being. Then in the second study I examine the performance of the households that participate in the stock market. First, the evidence from China on this issue is also consistent with that from developed countries. Investors that are poor, less-educated and facing high information costs underperform significantly. Moreover, two so-called 'investor mistakes' also undermine stock investment outcomes in China. Second, I study investor performance from a new angle, preference for information screening with respect to resources, and find that investors who rely on their own analysis when making trading decisions earn more. These investors are usually wealthier, have more financial knowledge and are more likely to be male.

My third study further explores determinant of investment performance by identifying a more fundamental, intrinsic and stable heterogeneity that is embedded

in human personality, i.e., trait anxiety, which reflects people's innate propensity to feel anxious. I find that investors who are more prone to anxiety have significantly inferior investment performance in terms of stock market return rate, after controlling for many other relevant factors. This finding is robust across investment periods of both half a year and three years, and across regressions using different proxies for trait anxiety.

DECLARATION

I declare that this is an original work based primarily on my own research, and I warrant that all citations of previous research, published or unpublished, have been duly acknowledged.

HUANG ZHEN

Date

CERTIFICATE OF APPROVAL OF THESIS

A STUDY OF HOUSEHOLD FINANCE IN CHINA

by

HUANG Zhen

Doctor of Philosophy

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Chapter 1. Introduction

Section 1. Research background

In his presidential address to the 2006 annual meeting of the American Finance Association, Professor John Campbell (2006) defined household finance as a new field of finance analogous to corporate finance, which asks ‘how households use financial instruments to attain their objectives’. This new field is important for at least two reasons. First, household investment outcomes are playing an increasingly critical role in household wealth accumulation, which is one of the basic concerns of economics. Due to equity premiums, the question of whether or not to invest in stocks can, at least theoretically, make a substantial difference to household wealth in the long run. Furthermore, some evidence shows that different outcomes in wealth accumulation can further enlarge existing income inequalities. Second, household investors’ behaviour in financial market affects asset pricing and consequently determines market efficiency (DeLong, Shleifer, Summers, & Waldmann, 1990; Dumas, Kurshev, & Uppal, 2009). In this context, household finance has significant implications for both academics and policy makers.

Like other fields, the study of household finance could be normative (i.e. to state what households should do) or positive (i.e. to describe what households actually do). Specifically, Campbell (2006) argues that the gap between normative household finance and positive household finance is central to this field since there are some large gaps between the theoretically ideal and observed actual financial behaviour of households. Hence, more research is called for on both normative and positive household investment. The standard theories claim that no matter how risk averse an individual is, s/he should include at least some risky assets in her/his portfolio and that an optimised stock portfolio should be fully diversified. In reality, substantial proportion of households in any economies does not invest in stocks. The normative theories therefore need to be extended to account for such a puzzle, which may be related to problems associated with transaction costs, borrowing constraints, life-long horizon and non-tradable and non-hedgable asset holdings. On the other hand, although behavioural finance has revealed a number of individual behavioural biases,

we still know little about how realistic the theoretical assumptions of different rational household investors are with respect to their financial investment behaviour. This situation is mainly due to the scarcity of high quality data to test these assumptions.

The field of household finance has developed considerably since Campbell's address to the American Finance Association 2006 annual meeting. Most importantly, in a series of subsequent papers, (Campbell, 2006; Calvet, Campbell, & Sodini, 2009a; Calvet, Campbell, & Sodini, 2009b; Campbell, Jackson, Madrian, & Tufano, 2011) find that for a minority of households, particularly poor and less educated households, their actual behavior diverge from theoretical optimal investment behaviour, with potentially serious consequences. As these discrepancies are difficult to be rationalised by controlling the small frictions that are ignored in standard financial theory, Calvet, Campbell, and Sodini (2009b) labelled such discrepancies as investor mistakes and constructed indexes to measure them. On the other hand, researchers working in the field of behavioural finance have been paying increasing attention to inherent individual heterogeneities that have universal predictive power for household investment behavior and performance. More recent studies have identified a variety of such heterogeneities, for instance, genetic makeup (Barnea, Cronqvist, & Siegel, 2010; Cesarini, Johannesson, Lichtenstein, Sandewall, & Wallace, 2010), IQ (Grinblatt, Keloharju, & Linnainmaa, 2012), sociability and trust (Hong, Kubik, & Stein, 2004; Georgarakos & Pasini, 2011).

Despite the above findings, household finance is still a very under-researched field. For example, the majority of the existing empirical studies use data from developed economies and relatively few studies examine developing economies. This also applies to China, the world's most populous country and second largest economy. Thus far, few studies have systematically examined how Chinese households invest in equity. In addition, it has long been established in psychology that personality traits, which are stable and observable, can be used to predict human behaviour and performance. However, economists have paid little attention to applying these powerful theories of Personality Psychology in investment studies. This PhD thesis aims to fill these research gaps.

Section 2. Main findings

This thesis comprises three interrelated studies. The most prominent division between positive household finance and normative finance occurs with the so-called ‘stock market non-participation puzzle’: why is it that some Chinese households participate in the domestic stock market and some refrain from doing so? I begin the thesis by exploring this question from three perspectives. First, following a standard approach (Campbell, 2006; Calvet, Campbell, & Sodini, 2009a; Calvet, Campbell, & Sodini, 2009b; Campbell, Jackson, Madrian, & Tufano, 2011), I show that the evidence from China is consistent with previous studies, which mainly focus on developed countries. That is, the poor and the less educated are less likely to hold equity in their financial portfolios, and variables reflecting cost, constraint, preference and expectation play a statistically significant role in stock market participation. Specifically, risk tolerance, wealth and financial knowledge stand out as the three most economically significant drivers of stock investment. Second, I investigate the stock market participation problem from the novel perspective of job satisfaction. In general, discontentment with one’s job motivates stock investment activity. Specifically, dissatisfaction with pay is the most influential aspect of job satisfaction that boosts stock ownership. Satisfaction with hours of work reflects the information cost in terms of opportunity cost, therefore increasing the probability of an agent participating in the stock market. Moreover, job stability and security reflect background risk exposure, and thus play a role in stock ownership decisions. Finally, satisfaction with job stability and security are found to be positively correlated with stock investment involvement.

Having established the determinants of stock market participation, it is natural to ask which participants in the Chinese stock market are most successful. Therefore, in the second study, I examine the performance of the households that participate in the stock market. As predicted by standard theory, I find that variables reflecting investor constraints influence individual stock investment performance. Evidence shows that the more constraints an investor is subject to, the lower the return rate on his/ her stock portfolio. The poor, the less-educated and investors with information disadvantage are found to underperform significantly, which I argue is because these investors bear higher information costs and consequently are more constrained.

Furthermore, two so-called ‘investor mistakes’ indeed undermine stock investment outcomes, as predicted by current theory and often observed in the literature. Next, I explore investor performance from a new angle – preference for information screening with respect to resources – and find that investors who rely on their own analysis when making trading decisions earn more. These investors are usually wealthier, have more financial knowledge and are more likely to be male. Evidence regarding their behavioural biases shows that they are less vulnerable to the disposition effect. These findings imply that agents with more information constraints are less capable of making trading decisions by themselves; consequently, they listen to others and make more mistakes. Interestingly, people in managerial positions tend to trust grapevine news, a preference for which is actually negatively correlated with investment performance, although not significantly. A possible explanation is that managers in China are overconfident about their access to genuine insider information, the use of which does not usually incur any penalties in China.

The results of the second study clearly indicate that particular individual heterogeneities predict investment outcomes. The latest literature also finds that a number of specific heterogeneities account for investor behaviour or performance, such as genetic makeup, IQ, cognitive ability, sociability and trust. A common feature of these factors is that they are either determinant of personality, a component of personality, or are predetermined by personality. This motivated me to test other intrinsic personalities as determinants for stock market performance. Specifically, there are a wealth of measures relating to personalities that have been investigated by psychologists and some of them, for example neuroticism, have been found to affect the job performance of individuals, and hence are more likely to also affect individual stock market performance. Therefore, using some unique information available in the dataset, in the third study I derive a proxy measure for trait anxiety, one facet of neuroticism. Empirical evidence shows that this proxy measure of trait anxiety, which captures an agent’s proneness to nervousness, is indeed negatively associated with stock market performance. These results are robust among the various alternative proxies and samples. Robustness checks also confirm that such an association is not due to endogeneity or reverse causality.

Section 3. Main contributions

This thesis makes several important contributions. First, it represents the first comprehensive study on Chinese households using a unique nationally representative dataset. The main advantage of this dataset is that it not only contains data that are commonly available from a typical household survey, but also has rich information related to a household's preferences towards and participation in financial markets. This unique feature of the dataset allows for the systematic examination of Chinese households' stock investment from a variety of different perspectives, some of which have and others of which have not been examined in the previous literature. Admittedly, despite the fact that this dataset is perhaps the best available for household finance study in China, it does have a number of limitations when compared with, for instance, the Swedish data studied by Campbell and his associates (Campbell, 2006; Calvet, Campbell, & Sodini, 2009a; Calvet, Campbell, & Sodini, 2009b; Campbell, Jackson, Madrian, & Tufano, 2011). Unlike the latter dataset, the dataset I use is not panel data, nor does it contain stock investment information based on tax or actual trading records.

Second, I borrow from existing psychological studies of personality and identify an important personality trait – trait anxiety (TA) – that is closely related to individual stock market performance. This finding has many important implications. For household and behavioural finance research, TA serves as a new candidate for contributing to ability, which is a common latent variable in many economic models. The effects of TA also shed light on the characteristics of would-be irrational investors and even noise makers in the stock market, who are very difficult to identify in advance. Furthermore, policy makers pursuing social fairness goals should take the effects of TA on investment outcomes into consideration. Household welfare requires policies that cater for vulnerable groups. Accordingly, anxious investors and their financial consultants deserve to know the innate limitations associated with TA. Along with this finding, I also develop a methodology to measure well-defined psychological traits using large survey data. This opens the way for household/behavioural finance to make greater use of psychological theories to study individual investment performance in the future.

Thirdly, although the two essays on stockownership and return performance mainly follow existing literature, I also consider some new factors that have not been covered previously. For example, I find job satisfaction can be used as a good proxy for background risk to explain stock market participation.

This thesis is organised as follows. In Chapter 2, I present the literature review. In Chapter 3, I describe the dataset. In Chapters 4, 5 and 6, I outline the three studies on stock market participation, stock investment performance and the effects of trait anxiety on individual stock investment, respectively. Chapter 7 concludes the thesis.

Chapter 2. Literature Review

The first time when ‘Household Finance’ has been presented and advocated as a sub-field was by Professor John Campbell in his presidential address to the 2006 American Finance Association annual meeting. After that, household finance has attracted growing attention and achieved more and more importance in the finance literature. The current study covers mainly two topics in this field: household stock market participation and individual stock investment performance. For the rest of this chapter, I firstly survey literature on stock market participation, which is abundant. I then summarize main research findings on individual stock investment performance. They fall broadly in the categories of so-called ‘investor mistakes’ and ‘individual heterogeneity’.

Section 1. Household Stock Market Participation Determinants

There are extensive researches on the topic of stock market participation. In Campbell (2006), he summarized the main explanations on what interacts with individual stock market participation: wealth, income, education, and some basic demographics, such as age, gender and marital status. More recent studies have incorporated other determinants, such as trust and culture (Guiso, Sapienza, & Zingales, 2008), the influence of neighbors and peers (Hong, Kubik, & Stein, 2004; Brown, Ivković, Smith, & Weisbenner, 2008), limited numeracy, intelligence quotient (IQ), and cognitive ability (Christelis, Jappelli, & Padula, 2010; Grinblatt, Keloharju, & Linnainmaa, 2011; Grinblatt, Keloharju, & Linnainmaa, 2012) and lack of asset awareness (Guiso & Jappelli, 2005). In this section, I summarize main findings by priori literature on determinants of stock ownership by classifying them into five categories: Financial characteristics, Demographic characteristics, Knowledge and ability, innate preference and External environment. In Appendix 5, I list the main papers under each category.

I. Demographic characteristics

Gender

Gender differences are usually linked to risk aversion. Evidence shows that women are less willing to take risks than men. Consequently, many papers have documented

that men are more likely to invest in stocks (Haliassos & Bertaut, 1995; Jianakoplos & Bernasek, 1998; Sundén & Surette, 1998; Barber & Odean, 2001).

Marital status

Many empirical studies incorporate marital status as control variable. The reason why it matters is usually linked to risk preference or risk sharing. For instance, according to Jianakoplos and Bernasek (1998), Sundén and Surette (1998), and Barber and Odean (2001), the differences on willingness to take risk between genders grow larger in single households because marriage helps risk sharing.

II. Financial characteristics

Wealth

Wealth is the most well-established determinant of stock market participation. Every research in this field finds the participation rate strongly increase with wealth. Majority of prior literature has focused on transaction and information costs in explaining how wealth affects stockownership (Vissing-Jørgensen & Attanasio, 2003). Fixed costs are usually defined as time and money spent in order to invest in stocks, and they are found to affect individual's stock market participation decision (Bertaut & Starr, 2002; Guiso, Haliassos, & Jappelli, 2003). Since the wealthy can obtain 'scale economies' on their investment with respect to fixed cost, fix cost is less likely to be a barrier of entry for the wealthier household (Guiso, Haliassos, & Jappelli, 2003). However, the theory of transaction and information costs cannot explain the significant variation in stock market participation even amongst the wealthy households (Mankiw & Zeldes, 1991; Heaton & Lucas, 2000).

Background Risk

Many observable factors contribute to background risk borne by investors, for instance, health status, entrepreneurship and job. Bad health conditions can increase expected variance on medical expenditure and labor income. In this context, one can categorize health status as a determinant of background risk level. Using self-perceived health status data from the Health and Retirement Study (HRS) in the U.S, Rosen and Wu (2004) find that households in poor health are less likely to hold financial assets compared to healthy households.

III. Knowledge and ability

Education

Education is found to have a strong positive effect on households' stockownership (Haliassos & Bertaut, 1995). Cole and Shastry (2009) report a remarkable 7% to 8% increase in the probability of financial market participation with only one additional year of schooling. The channels for education to affect stock market participation are multiple. Firstly, according to Campbell (2006), education reduces the costs of stock market participation defined in broad terms, as it is easier for educated investors to understand the risk-reward trade-off of markets and to actually execute trades. Secondly, education increases financial literacy and cognitive skills, or by affecting social networks, job opportunities and beliefs and attitudes (Cole & Shastry, 2009).

Financial literacy

Van Rooij, Lusardi, and Alessie (2011) find that those with low literacy are much less likely to invest in stocks. The authors devised two special modules for the DNB (De Nederlandsche Bank) Household Survey (DHS), which is a panel data set covering a representative sample of the Dutch population and providing information on savings and portfolio choice. Their econometric analysis result on the data shows that lack of understanding of economics and finance is a significant deterrent to stock ownership, after cognitive abilities being controlled.

Awareness

Using data on the 1995 and 1998 waves of the Italian Survey of Household Income and Wealth, Guiso and Jappelli (2005) find 'Lack of financial awareness has important implications for understanding the stockholding puzzle and for estimating stock market participation costs'.

Cognitive abilities

Cognitive abilities have been one of the main focuses in recent research on stock market participation due to its crucial role in constituting information cost of individual's to participate in stock market.

Several recent papers provide strong evidence. Using the US Longitudinal Survey of

Youth, Cole and Shastri (2009) report that cognitive ability plays a major role in the overall decision to participate in the financial markets. Similar conclusion was drawn by Christelis, Jappelli, and Padula (2010), using the math, verbal and recall tests of Survey on Health, Aging and Retirement in Europe (SHARE).

If note that cognitive ability is correlated with IQ and determined by a large extent by gene, the evidences are more abundant. An impressive finding is by Grinblatt, Keloharju, and Linnainmaa (2011) that individuals with high IQ scores measured in early twenties are more likely to invest stock in the later life, having all relevant demographic and occupational variables being controlled. This effect remains significant even amongst the most affluent 10% of their sample. By decompose the cross sectional variation in investor behavior, Barnea, Cronqvist, and Siegel (2010) find that genetic factor explains about one third of the variance in stock market participation and asset allocation in a study of twins. Their interpretation of this genetic component of stock market participation is that there are innate differences in factors affecting effective stock market participation costs, and they attribute the genetic component of asset allocation to genetic variation in risk preferences.

As a financial decision, stock market participation involves a specific human capital investment in terms of effort and time from the investors to first familiarize themselves with the concepts involved in investing and later on to follow the market development to make justifiable financial decisions. Therefore, cognitive abilities can significantly affect stockownership by affect fixed participation cost.

On the other hand, cognitive abilities also affect individual decision making through changes in time and risk. Using US Longitudinal Survey of Youth, Benjamin, Brown and Shapiro (2006) find that more cognitively able individuals are more risk neutral over small stakes and more patient over short time horizons. Dohmen, Falk, Huffman, Sunde, Schupp and Wagner (2011) study a random sample of 1,000 German adults and report that lower cognitive abilities are associated with greater risk aversion and impatience even controlling for education, income and credit constraints.

IV. Innate preference

Risk aversion

It has been widely documented in prior literature that risk aversion reduces the probability of stock market participation. The first influential study that demonstrates extremely high risk aversion as an explanation for non-participation in stock market may be by Mehra and Prescott (1985). Later on, a body of literature attributes low risk tolerance to low stock market participation rate in reality. For example, Mankiw and Zeldes (1991) quantify the level of risk aversion based on historical risk premiums. Vissing-Jørgensen and Attanasio (2003) concludes that non-stockholding households are more risk averse than their stockholding counterparts.

Trust

The role of trust in stock market participation attracts much attention recently. This is mainly aroused by two papers of Guiso, Sapienza, and Zingales (2008) and Georgarakos and Pasini (2011). Using the World Values Survey, Guiso, Sapienza, and Zingales (2008) find that trusting individuals are significantly more likely to be stockowners, with the effect of trust remains equally strong for wealthier households. Georgarakos and Pasini (2011) come to similar conclusions in their study of trust, sociability and stock market participation. In addition, their evidence shows that the effect of regional changes in trust is strongest in the countries where the prevailing level of trust is low.

Personal values

Kaustia and Torstila (2011) for the first time link personal values with investment decisions. The authors postulate that a portion of the public can shy away from the stock market due to their personal values when they apply value-expressive considerations in their stock market participation decision. Evidence from unique data sets in Finland is consistent with their idea that personal values are a factor in important investment decisions: there exists a strong positive correlation between political orientation and investing in stock, with a moderate left voter being 17-20% less likely to own stocks than a moderate right voter.

Sociability

Sociability and social interaction have been one of the main focuses in recent behavioral finance research. Because of the high correlation between these two issues, I introduce them together in the next subsection.

V. External environment

Social interaction

Growing evidence shows that social interaction influences stockownership decision. In 2004, Hong, Kubik and Stein find that households interacting with their neighbors or attending church are more likely to participate in the stock market than non-social households. Brown, Ivković, Smith, and Weisbenner (2008) establish a causal relation between individual and community stock market participation. The authors find that a 10% increase in community stock ownership increases the probability of individual stock market participation by 4% on average. And individuals' stock market entry decisions are shown to be affected by the stock investment performance of their local peers in the previous month, according to Kaustia and Knüpfer (2012).

There are several different mechanisms through which social interaction can stimulate stock market participation. According to Hong, Kubik, and Stein (2004), social interaction lowers the fixed psychological costs of stock market participation because information can be exchanged by means of word-of-mouth communication or observational learning (Bikhchandani, Hirshleifer, & Welch, 1992; Ellison & Fudenberg, 1993; Ellison & Fudenberg, 1995). Alternatively, Guiso and Jappelli (2005) interpret Social interaction and social learning function as an additional channel for financial awareness if information distribution otherwise is scarce.

Culture

For long time, culture was found to have impact on stockholding. An intra-country analysis of Finnish stockholders shows that households are apt to the influence of distance, language and culture (Grinblatt & Keloharju, 2001a). And Stulz and Williamson (2003) find that cultural aspects explain cross-country variation in individual stockholder rights even controlling for the legal origin of a country. More recently, the integration of cultural aspect and financial questions has led to studies on its implications for financial markets. Breuer and Quinten (2009) even propose to

separate ‘cultural finance’ to its own autonomous discipline.

Section 2. Determinants of Investment Performance: Behavioral Bias and Individual Heterogeneity

Why do individual stock investment performances vary? If the markets are always efficient in the sense that they always correctly pricing assets, then the optimal strategy should be passive strategy, where everybody end up with identical market return. However in reality, due to market inefficiency as well as individual-specific liquidity and information constraints, investors choose heterogeneous strategies which lead to variations in outcomes. The interesting question is what individual investor characteristics can lead to differences in investment strategies that in term affect investment outcomes across periods and markets. The literature directly linking investor heterogeneities with their stock investment performance are rare. I divide them into two types: (1) papers investigating investor behavior bias which is detrimental to investment performance; (2) papers investigating human’s intrinsic heterogeneities’ effect on investor behavior which eventually determines investment performance. I will respectively introduce them one by one.

Investor mistake or investor behavioral bias refers to investor behavior that is deviate from theory predicted rational and leading to detrimental consequence. Campbell (2006) labeled under-diversification, risky share inertia, and the tendency to sell winning stocks and hold losing stocks (the disposition effect) as investor mistakes. They carried out a series of work to investigate the determinants of these mistakes and their consequences in terms of investment return. Campbell (2006) argues that a minority of households makes significant investment mistakes, according to evidence on participation and diversification. He further finds that the minority is poorer and less well educated than the majority of more successful investors. Calvet, Campbell and Sodini (2007) investigate the efficiency of household investment decisions in a dataset containing the disaggregated wealth and income of the entire population of Sweden. Their analysis focuses on two main sources of inefficiency in the financial portfolio: under-diversification of risky assets (‘down’) and nonparticipation in risky asset markets (‘out’). They find that a few households are very poorly diversified.

They document that the welfare cost of nonparticipation is smaller by almost one half when they take account of the fact that nonparticipants would be unlikely to invest efficiently if they participated in risky asset markets. Calvet, Campbell and Sodini (2009b) constructed an index of financial sophistication that explains a set of investor mistakes: under-diversification, risky share inertia, and disposition effect. Using comprehensive data on Swedish households, their index of financial sophistication predicts performance well. This index is strongly positively correlated with financial wealth and household size, and also positively correlated with education and proxies for financial experience.

On the other hand, in the recent three years, many papers published in top financial journals explored the household finance with emphasis on individual heterogeneities, especially intrinsic heterogeneities, such as genetic factor (Barnea, Cronqvist, & Siegel, 2010), trust, peer effect and sociability (Hong, Kubik, & Stein 2004; Guiso, Sapienza, & Zingales, 2008; Georgarakos & Pasini, 2011; Kaustia & Knüpfer, 2012), cognitive ability; Dohmen, Falk, Huffman, Sunde, Schupp & Wagner, 2011), and intelligence quality (IQ) (Grinblatt, Keloharju, & Linnainmaa, 2012). These recent work encourage a direction to reveal intrinsic heterogeneity among investors. For instance, Grinblatt, Keloharju, and Linnainmaa (2012) analyse whether IQ influences trading behavior, performance, and transaction costs. They find that high-IQ investors exhibit superior market timing, stock-picking skill, trade execution, and are less subject to the disposition effect, more aggressive about tax-loss trading, more able to control a variety of factors. As a result, High-IQ investors achieve much higher stock investment return rates. Take gambling performance as another example. In the paper ‘Who gambles in the stock market?’, Kumar (2009) finds that socioeconomic factors that induce greater expenditure in lotteries are also related with greater investment in lottery-type stocks. His evidence shows that investor with gambling preference are more likely to underperform because they fancy lottery-type stocks which underperform. And these investors who excessively overweight lottery-type stocks are more likely to have low-income.

Chapter 3. Data and Descriptive Statistics

Section 1. Data source

The dataset for this study combines two surveys: a random subsample of the 2009 China Urban Household Survey (CUHS) and a trailer survey applied on this subsample, the China Household Finance Service Demand Survey (CFS). As aforementioned, the CUHS, which has been carried out annually by the State Bureau of Statistics since the beginning of 1980s, is the best available nationally representative survey of urban households in China. The questions in the CUHS cover a wide range of individual-level detailed information including household members' demographic characteristics, employment information, income and expenditure, and household-level information including household size, composition and living conditions. The CUHS is based on a probabilistic sample and stratified design. The sample is designed to be representative of the populations in over 220 cities and towns of various sizes and in various regions in China. The cities, towns and households are selected based on the principle of random and representative sampling. The data are collected over the course of a year. The participating households are asked to keep a record of their income and expenditure, which is collected every month by a surveyor. The rich data used in this thesis come from the 2009 survey. So far, CUHS is the best available household survey in China and has been studied by numerous scholars, including Heckman and Li (2004), Chamon, Liu, and Prasad (2010).

The CFS was designed by members of the Department of Economics at Lingnan University, Hong Kong. The questions in the CFS cover an exhaustive breakdown of householders' assets, stock holdings, and investment preferences, attitudes, behaviour and performance, together with a series of questions on how the global financial crisis affected their personal and economic wellbeing. The CFS was collected exclusively for Lingnan University by the Department of Urban Surveys of the State Bureau of Statistics of China as a trailer survey of a random sub-sample of the 2009 CUHS. The CFS randomly selected 10,043 households out of the total 65,000 households covered by the 2009 CUHS. After data cleaning, 10,030

observations were included in the sample.

Section 2. Main advantage and disadvantage of the dataset

One of the main advantages of the dataset is its good combination of information on abundant demographic and financial characteristics. It also contains a host of subjective and objective investment-related variables. In addition to demographic, job and financial characteristics that are common in household surveys, the questions in our surveys cover a wide range of information regarding exhaustive breakdowns of asset allocation, income and consumption patterns and various factors relating to the stock market investment attitude, behaviour and performance of heads of households. For example, it contains variables reflecting risk aversion, gambling preference, marginal consumption tendency, optimism in expectation on economy and social development, job and life satisfaction, information screening preference for stock trading, etc. The information that is typically not available in many other datasets has proven to be an important factor affecting individual investment. Thus, this rich dataset provides a unique opportunity to investigate households' investment decisions from various new angles. Moreover, the most distinguishing feature of the dataset lies in the type of experimental questions it contains on global financial crisis; this enables me to derive proxies for personality trait anxiety.

Admittedly, the dataset also suffers from some limitations. For instance, unlike the Swedish data used by Campbell (2006), Calvet, Campbell, and Sodini (2009a), Calvet, Campbell, and Sodini (2009b), and Campbell, Jackson, Madrian, and Tufano (2011), information on investment return is self-reported by interviewees rather than from trading records. Such measures may be more prone to individual misreport and measurement errors. Therefore, to reduce the influence of these potential measurement errors, I first carry out a sensitivity test of the results on stock investment return using an alternative measure: a dummy variable indicating whether an individual has suffered recent losses in the stock market. This measure, although less informative, should prove more reliable. Second, the dataset is merely cross sectional rather than panel, which prevents me from examining the long-term effects of many factors and makes it difficult to control for missing information. Third, the quality of Chinese data is often criticised. However, most of the controversies

regarding the accuracy of the data collected by the Chinese government relate to the macro data. The CFS is a micro dataset collected from many individual households, rather than constituting macro data reported by local governments. Furthermore, the questions in the trailer survey were all designed and commissioned by the research team of Lingnan University, and carried out by the DUS (Department of Urban Surveys) of the State Bureau of Statistics, which has little incentive to manipulate the data.

Section 3. Summary on variables

To summarise the main characteristics of the data, I report descriptive statistics of basic demographic characteristics, financial characteristics and other key variables in the regressions, respectively in Tables 1, 2 and 3.

All respondents in the sample are household heads. As shown in Table 1-1, the mean age of interviewees is about 49 with a standard deviation of 11.97 years; 11.52% of respondents are below 35 years old; 27.14% are from 35 to 44; 43.44% are from 45 to 59, and the remaining 17.90% are 60 and above. Out of 10,030 effective observations in the sample, nearly 34% of households are headed by females. Among these 3,405 women, 2,827 are married and the remaining 578 are single, divorced or widowed. Therefore, roughly 30% of married couples select the female as the household head. This is not surprising as the household head is defined as the family member who is in charge of major decisions for the family, and is usually also the main breadwinner. With respect to nationality, the minority counts for 3.18% of the sample and the rest are of Han nationality. The size of households in the sample ranges from 1 to 8 people, with an average of 2.9. Such a low figure is a direct result of China's one child policy. Table 1-2 reports the composition of households with respect to their self-reported preferences and attitudes such as risk tolerance. Half of the household heads in the sample claim that they prefer moderate exposure to financial risk for corresponding risk premium. However, 42% of them are not willing to take any risk at all. Only 8% of households choose the 'high risk with high return' pair.

Table 2, Panel A shows the descriptive statistics for households' financial condition

variables. They are the first four moments and three important percentiles of family asset, income, expenditure and relevant ratios. All variables are left skewed and leptokurtic, with means much bigger than medians. Abnormal observations deviated far from the means. Considering bank savings as an example, the households on the 25th percentile have only 10,000 RMB Yuan while those on the 95th percentile have 20 times that amount. Although the mean value of bank savings is about 89,000 RMB Yuan, the median is only 30,000. From Table 2, Panel A, we can see that residential housing is the most significant asset for the majority of households while stock is the main form of financial asset held by Chinese households. The bond holding is negligible. Less than 5% of households own real estate as an investment. Table 2, Panel B gives further breakdowns of some financial characteristics, together with the stock ownership ratio conditional on them. 12.68% of the households in the sample have income less than half of the median. Only 6.49% of these people own stocks. 14.57% of households in the sample do not have bank savings, but 14.58% of these own stocks. About 85.3% of households own real property, and 5,646 people have no mortgage, which accounts for 66% of home owners.

Table 3 has three Panels, in which I summarise the descriptive statistics of the key variables in my regressions. The variables are listed in sequence according to their appearance in regressions. For example, in Panel A, those variables measuring wealth and income, education and information attainment appear in all three essays; variables measuring job satisfaction are key for both the first and the second essay, which are respectively elaborated in Chapters 4 and 5. It is worth noting that for many variables, the mean and median diverge considerably. The most noticeable difference is witnessed in Panel B on AR_1 , which is seriously skewed. Similar to AR_2 , the median of AR_1 is also negative, -5.9%, but the mean is positive, about 2.8%. More detailed information can be seen in Figures 3 and 4, which show the distributions of the return rates.

Chapter 4. In or Out: Stock Market Participation

Section 1 Introduction

The discrepancy between real-life stock investment behaviour and theoretically ideal behaviour is central to the study of household finance, according to Campbell (2006). To investigate this key problem, the natural first step is to explore the determinants of household stock ownership. In other words, when Chinese households are confronted with stock markets, who participates and who stays out?

This ‘In or Out’ question has been widely investigated over the past five years, and is well-known for the ‘stock market nonparticipation puzzle’. As Bonaparte and Fabozzi (2011) observe: *‘Only 19% of U.S. households hold stocks directly according to data from the 1998 Survey of Consumer Finances (SCF). This low rate of participation is puzzling to economists because the historical average annual return of the U.S. stock market has been approximately 700 basis points higher than the return on U.S. Treasury bills’*. Addressing this puzzle has at least three important implications. First, stock market participation allows the equity premium to play an important role in household welfare accumulation and hence affects living standards, which are the ultimate concern of economic development. Due to the equity premium, investment in stock will, theoretically, make a substantial difference to household wealth accumulation over the long term. Second, there is some evidence to suggest that different outcomes of wealth accumulation can further increase income inequality with increasing severity. Third, the welfare benefits of financial markets rely to a large extent on how efficiently households exploit the markets, and market efficiency also depends on the behaviour of households as market participants. In fact, the above-stated puzzle has long been known to economists and Mehra and Prescott (1985) coined it the ‘equity premium puzzle’¹. In short, the issues of household welfare, income inequality and market efficiency are all tightly linked to research on positive finance that aims to identify the determinants of households stock market participation.

¹ For more reference, see Cochrane (2001). For the link between stock market participation and the equity premium puzzle, see Mankiw and Zeldes (1991).

Despite the many efforts that economists have made over the past two decades to explain this puzzle, household stock market participation largely remains the ‘black box’ of household finance decision making. The study reported in this chapter contributes to the body of literature on the ‘stock market nonparticipation puzzle’ in the following three respects. First, it examines whether the stock participation behaviour of Chinese households is consistent with such behaviour in other developed countries. Second, it aims to show whether the decision to invest in stock resembles the decision to take a second job by exploring how job satisfaction affects household stock-ownership decisions. I investigate respondents’ self-reported satisfaction with several aspects of their jobs and find that dissatisfaction with the job overall, and with pay and fringe benefit specifically, lead to stock investment behaviour, whereas satisfaction with hours of work, job stability and security boost the likelihood of employees becoming stock owners. The evidence implies that the stock market participation decision is subject to the same underlying incentives as the second job participation decision.

The findings from the study have the following implications. First, the study applies a standard empirical approach to a unique Chinese household survey dataset. In so doing, it enriches the literature by providing new evidence from a large, developing and transitional economy. My findings indicate that the majority of the phenomena and rules in China are consistent with those found in, for example, the US and Europe. As numerous pioneers in this domain report in relation to developed countries, the stock market participation rate in China is low (about 20% according to the data). It also exhibits heterogeneities with respect to wealth and information cost that account for the stock investments of Chinese households. As mentioned by Campbell (2006), studying positive household finance has always been difficult due to the scarcity of data. High quality data from developing countries are even harder to come by. Moreover, studies conducted in China have special implications for this domain because China is a huge developing country, its stock market only re-opened two decades ago and it is still under strict control by the government. China is also unique due to its fast economic growth rate during the past three decades and its extremely high household saving rate. In this context, the current study fills an important gap in the literature on positive household finance in China.

This study also introduces a new perspective by linking job satisfaction with stock market participation. To my knowledge, this is the first empirical study to find evidence that dissatisfaction with one's job in general, and pay in particular, satisfaction with hours of work and job stability all influence stock market participation. Intuitively, investing in stock resembles taking a second job in two respects: first, they both cost time, i.e. labour input; second, they are both intended to boost income. In this context, dissatisfaction with one's job should be a motivation to take a second job, including the 'quasi job' of stock investment involvement. This conjecture is also consistent with the predictions from the prospect theory, in which dissatisfaction with one's job and job income makes an individual more willing to entertain other risky opportunities. In contrast, satisfaction with one's job security can be viewed as reflecting a lower level of background risk. The empirical results show that the evidence from China supports these theoretical predictions well. The findings here contribute to the literature on both labour economics and finance.

The remainder of the chapter is organised as follows. In section 2, I study the determinants of stock market participation using a traditional approach. In Section 3, I explore stock-ownership decisions specifically from the perspective of job satisfaction. In Section 4, I investigate whether public sector employees differ with respect to their stock market participation behaviour. Section 5 concludes.

Section 2 Determinants of Stock Market Participation in China

I. Empirical Framework

The standard Consumption Capital Asset Pricing Model (CCAPM) and other textbook models fail to explain the lower than expected stock market participation rates. This is often referred to as the stock market participation puzzle, which has been linked to the equity premium puzzle. Mehra and Prescott (1985) proposed that the latter could be improved by incorporating additional frictional factors, such as transaction, information and entry costs. Since then, the equity premium puzzle and stock market participation puzzle have become entangled in a sub-strand of the literature. There has been some interest in examining how the stock market participation puzzle relates to the equity premium puzzle. Consequently, numerous studies have sought to identify the important determinants of stock market participation that ease the above mentioned market frictions. Bogan (2008) constructs a calibrated CCAPM model from the standard frictionless CCAPM by adding constraints such as transaction, information and entry costs, which satisfies the necessary frictional conditions suggested by Mehra and Prescott (1985). In the calibrated CCAPM (Bogan, 2008), agents maximise the expected value of discounted utility. The utility function is additively separable, and future utility is discounted at a rate of δ . Each agent can borrow or invest in two assets, risk free asset with a riskless rate of return and stock with a stochastic return. As shown in the following, the optimisation specification is the same as that of a standard frictionless CCAPM, but the constraints are different. Here the additional factor, i.e. the cost/opportunity cost of the time spent in obtaining investment information or transaction costs, is modelled and represented by the lump sum expense of purchasing investment information.

$$\max_{c_t} E_t \sum_{t=0}^T \delta^t U(c_t)$$

$$\text{s.t. } c_t = W_t + y_t - s_t - I_t$$

$$W_{t+1} = s_t(1 + r) + \alpha_t Z_t$$

Where meaning of symbols are as following:

c_t : real consumption in time t

W_t : total wealth at time t

y_t : exogenous real labor income in t

s_t : total real saving in t

I_t : a cost of individual stock market participation, referring to cost (including opportunity cost) of the time spent in obtaining investment information or transaction costs

$1 + r$: the gross riskless return

α_t : the amount saved in the risky asset in time t.

z : is the excess return on stocks over the riskless rate

It is worth noting that when the initial cost of acquiring the information necessary for market participation, or the recurring expense of maintaining a portfolio and investing in new opportunities, is high enough, an individual will persistently shun away from the market as result. Thus, if the cost of participating I_t is perceived to be sufficiently high to remove the expected utility gain, the household will not invest any stock.

The allocation of disposable income to capital assets in Bogan's calibrated CCAPM model is based on a household utility optimisation equation. Because theory expects individuals to maximise their utility function, economists are able to model the optimal allocation levels from an indirect utility derived from the CCAPM. Following Bogan's approach² for defining the dependent variable, between the assumed linear indirect utility function of stockholders $U_{si} = X_{si}B_s + e_{si}$, and that of non-stockholders, $U_{nsi} = X_{nsi}B_{ns} + e_{nsi}$, where X_i are the observable characteristics of household i and e_i is the error term. Because the indirect function is unobservable, we must turn to the participation decision of household i , D_i to participate or abstain. If $D_i = 1$ when $U_{si} > U_{nsi}$, it implies that a household participates in the stock market because its indirect utility is greater when holding than when not holding stocks. Following the same reasoning, $D_i = 0$ when $U_{si} < U_{nsi}$ because a household will abstain from the stock market when its utility is not maximised when holding stocks. These outputs, $D_i = 1$ and $D_i = 0$, are the two outcomes of the binary dependent

² The Bogan's approach is consistent with Mankiw and Zeldes (1991).

variable, Stock-owner Dummy, $P(D_i = 1) = P(U_{nsi} < U_{si})$.

Moving towards the right side of the equation, the focus turns to the household characteristics that affect the probability that a household owns stock at time 0. I classify the potential determinants of stock market participation into two categories: (1) general household characteristics contributing to constraints and (2) behavioural heterogeneity. The variables in the first category reflect the components in Bogan's calibrated CCAPM. I further divide them into three groups, reflecting the wealth effect, information cost and demographic characteristics, which are usually used as control variables in the literature. They are correspondingly named as WEALTH, INFORMATION and X in the following model specifications, where X denotes the control variables.

Similar to an approach taken in Hong, Kubik, and Stein (2004), my empirical model specification is as following:

Model (I):

$$\begin{aligned} OWNSTK_i = \beta_0 &+ \sum_{l=K+1}^L \beta_n WEALTH_{ik} + \sum_{p=L+1}^P \beta_n INFORMATION_{ip} \\ &+ \sum_{n=M+1}^N \beta_n BEHAVIORAL_{in} + \sum_{k=1}^K \beta_n X_{ik} + \varepsilon_i \end{aligned}$$

For robust check, I have another three models with specification as the followings:

Model (II):

$$OWNSTK_i = \beta_0 + \sum_{k=1}^K \beta_n X_{ik} + \sum_{l=K+1}^L \beta_n WEALTH_{ik} + \varepsilon_i$$

Model (III):

$$OWNSTK_i = \beta_0 + \sum_{k=1}^K \beta_n X_{ik} + \sum_{p=K+1}^P \beta_n INFORMATION_{ip} + \varepsilon_i$$

Model (IV):

$$OWNSTK_i = \beta_0 + \sum_{k=1}^K \beta_n X_{ik} + \sum_{n=K+1}^N \beta_n BEHAVIORAL_{in} + \varepsilon_i$$

By including fewer independent variables, the robustness check regressions are less likely to suffer multicollinearity problems. Comparison between the model results will provide a better understanding of each determinant's effect.

II. Regression Results and Robust Check

The main results are reported in Table 4-1, Panel A column (I). The dependent variable in the regression is a binary variable, i.e. Stock-owner Dummy, which takes the value of one if a respondent had previously participated or was currently participating in the stock market at the time s/he took the survey, and zero otherwise. The independent variables comprise two groups of variables, one reflecting constraints and the other reflecting behavioural heterogeneities, controlled by a variety of demographic characteristics, working industry, occupation and position. The partial effects measured by the means of the independent variables are reported in column (I); the coefficients, z values and p values are reported in columns (II), (III) and (IV) respectively, while column (V) reports the means of the independent variables. The regression is run with a sample of 9,027 observations. The predicted participation rate is 16.75% at the mean of each independent variable. The observed rate is 22.76%. The estimated pseudo R square of the model is about 21%, which is rather high for a cross-sectional regression study. Many variables are significantly correlated with stock market participation, consistent with theoretical predictions or previous findings. Most of their coefficients are significant at the 1% level. The results of the analyses are presented in detail in the following sections.

The results of the robustness check regressions are reported in Table 4-1, Panel B columns (II) and (III), while in column (I) same regression to that in Panel A is listed for comparison. Specification (II) only includes the group of independent variables reflecting constraints, which are mainly concerned with wealth and information cost, whereas specification (III) only includes the group of independent variables reflecting behavioural facts.

Wealth

I exploit two wealth measures: total household assets, and a group of dummy variables. Unsurprisingly, Total Asset stands out as the most influential determinant of stock ownership. In the mean position, every 10,000 RMB increase in Total Asset leads to an increase of 11.5% in the probability of a household investing its equity. The survey also included the question³ ‘How do investment results affect your daily life? (1) a lot, (2) a little, (3) no effect’. I define a group of dummy variables, High Vulnerability to Wealth Risk Dummy, indicating respondents who chose ‘(1) a lot’, and a No High Vulnerability to Wealth Risk Dummy indicating respondents who chose ‘(3) no effect’, while respondents who chose (2) are used as the reference group. As shown in Panel A of Table 4-1, individuals who indicated that investment outcomes had ‘a lot’ of effect on their lives were 7.9% less likely to hold equity than the reference group. In contrast, those who indicated ‘no effect’ had a 5.1% higher probability of investing than the reference group.

The robustness check in model (II) produces the similar result as that in model (I). There is considerable variation in both the magnitudes and confidence levels, implying that Total Wealth is strongly correlated with other explanatory variables.

Information Constraints

The cost of stock market participation may be the entry cost or the information cost. The entry cost serves as a threshold for a household’s wealth: it only matters for households that are extremely poor. Conceivably, the information cost plays a broader role in households’ in-or-out decisions. As the ability and accessibility to information are attributed to the individual-specific information cost, I exploit the variables that reflect them.

First, education level and labour income are traditional proxies for ability. Compared with those with a below high school level of education, those with higher education levels have a greater propensity to participate in the stock market. High school or technical school diploma holders are 4.6% more likely to participate in the stock market. A college education increases this difference in participation to 5.9%.

³ See Appendix 2 Q7.

Unsurprisingly, personal labour income is positively correlated with the probability of stock market participation.

Three variables more directly reflect information cost. Those who have some knowledge of financial matters are 6.9% more likely to invest equity than those who have no idea about whether the global financial crisis ever occurred. Dwelling in a financial centre metropolis and having Internet access at home also increase the probability of participation by roughly the same amount.

The robustness check reported in Column (II) of Panel B supports all of the above findings. The material difference in the magnitudes of the coefficients and the confidence levels for educational attainment and labour income suggest that these variables interact with other independent variables.

Behavioural Heterogeneity

Many findings from the group of variables reflecting individual heterogeneities in terms of risk preferences, gambling preferences, propensity to consume and beliefs about the future economy are consistent with the literature. The risk aversion effect stands out as the most influential determinant. The survey asked respondents to choose an asset from three options: (1) high risk and high expected return; (2) medium risk and medium expected return; and (3) no risk at all. Consequently, I include a dummy variable, High Risk Tolerance Dummy, to indicate a choice of (1); a Low Risk Tolerance Dummy to indicate a choice of (3); and a Medium Risk Tolerance Dummy to indicate the choice of (2), which is omitted from the regression as the reference. The regression results show that choosing the high-risk-high-return asset increases the probability of stock ownership by 10.4%, while this probability drops by 22.5% for those who report zero tolerance on financial risk. Lottery ticket buyers are also more likely to buy stock, other things being equal. Unsurprisingly, personal optimism about the future economy is positively associated with stock market participation. Such a finding is intuitive if we believe that optimism about the future economy leads to the expectation of higher stock market returns. Finally, individuals who are less inclined toward frugality are more likely to invest in stocks.

Panel B model (III) presents the results of the robustness check on the effects of behavioural heterogeneities. The results are almost identical to those in Panel B model (I), implying that these effects are independent from the other group of explanatory variables.

Demographic characteristics

The probability of stock market participation appears to increase with age, but at a decreasing rate. Such a result seems to fit intuition well. When people are young they have few savings and hence are less likely to be able to invest in stocks. Once people are approaching or are past retirement age, their savings again decline and, as they have to live on past savings, their investments tend to be more conservative.

According to the partial effect reported by the probit model, females in China have about a 4.5% higher probability of participating than males. This finding is consistent with the descriptive statistics in Table 1, which show that the conditional participation rate is 21.53% for females and 17.70% for males. Although this result may seem puzzling, it is consistent with some previous studies. A possible explanation is that females may face lower opportunity costs than males.

Again, marriage is found to have a positive influence on stock ownership. The partial effect reported by the probit model suggests that married couples have a 6% higher probability of participating than others. This is also consistent with the conditional participation rate shown in Table 1, which are 20.82% for married heads of households and 12.37% for others.

Finally, those from ethnic minorities are significantly less likely to buy stocks than the Han majority, with the difference in the estimated probability as high as 7%.

Section 3. Job Satisfaction and Stock Market Participation

A household's portfolio is comprised not only by financial assets but also human capital. Human capital resembles bonds in two respects: human capital generates labour income just as bonds yield coupon; and labour income is subject to risk just as a bond's coupon is. Conversely, to invest in the stock market is similar to taking on a second job in two respects: both are intended to boost income, and both cost time and energy. The construction of a financial portfolio is a task that should not be isolated from overall household portfolio construction problems, i.e. a household's decisions with respect to financial markets and its decisions in relation to labour market interact. In reality, the majority of households have labour income. Meanwhile investing in stock is an available option for boosting income, and is similar to taking a second job. It is well known that the motivation for taking a second job is often related to the status of the primary job. The question is how job related factors influence a household's motivation to invest in equity. In this section, I investigate household stock market participation decision from a new perspective: job satisfaction; in my study this includes both overall job satisfaction and satisfaction with three specific aspects, respectively pay, hours of work, and job stability.

I. Theory and hypothesis

As stated above, when one considers that participating in the stock market is similar to taking a second job, it is then natural to link job satisfaction with an individual's decision to invest in the stock market. There are several well-known theories in finance that lead to the same conclusion. I present these theories together with a corresponding prediction on how job satisfaction affects stock market participation decision.

Prospect theory

According to the prospect theory⁴ put forward by Kahneman and Tversky (1979), an agent is more likely to be risk averse when he is already gaining or when things are generally going well for him, and risk seeking when he suffers a loss or when things are generally not going well. Based on this theory, if an agent holds higher overall

⁴ The model is illustrated in Figure 1.

job satisfaction and higher satisfaction with pay (gaining) specifically, he is more likely to be risk averse and hence less likely to participate in the stock market. Hence, we have the following hypothesis:

Hypothesis 1: People who hold higher overall job satisfaction and/or satisfaction with job pay are less likely to participate in the stock market.

Background risk

It is established in the literature (Heaton & Lucas, 2000; Rosen & Wu, 2004) that background risk exposure effectively decreases investment in stock. Intuitively, job stability and security should influence a person's assessment of their own background risk. Therefore, I hypothesise that satisfaction on job stability and security are positively correlated with willingness to include risky asset like stock in one's portfolio. Hence, we have the following hypothesis:

Hypothesis 2: People who hold higher satisfaction with job stability and job security are more likely to participate in the stock market.

Participation cost

In general, whether an individual participates in the stock market should be related to the inherent cost that individual faces by so doing. Because stock market participation is a time consuming activity, time cost is an important element of participation cost. Hence, other things being equal, it is reasonable to assume that an individual with more free time is more likely to participate in the stock market. Intuitively, someone who reports higher satisfaction with hours of work is more likely to have more free time. Therefore, we should expect a positive correlation between satisfaction on hours of work and stock market participation.

Hypothesis 3: People who hold higher satisfaction with hours of work are more likely to participate in the stock market.

II. Empirical evidence

The regression model for testing the aforementioned hypotheses takes the following form:

Model:

$$OWNSTK_i = \beta_0 + \beta_1 S_Job + \beta_2 S_Pay + \beta_3 S_Time + \beta_4 S_Stability + \beta_5 S_Security + \varepsilon_i$$

where *OWNSTK* refers to Stock-owner Dummy; and ‘S_’ in name of independent variables refers to ‘Satisfaction on’ for short.

Hypothesis:

$$\beta_1 < 0, \quad \beta_2 < 0, \quad \beta_3 > 0, \quad \beta_4 > 0, \quad \beta_5 > 0$$

The regression results provide strong support for the hypotheses, and the findings are persistent to the robustness checks. As reported both in Table 4-2, Panel A column (I) and Panel B column (I), all of the effects have the predicted sign, and are significant at least at the 5% confidence level. Every one unit decrease in the general satisfaction with job scores leads to a 3.3% increase in the probability of the agent participating in the stock market. Specifically, satisfaction with pay and fringe benefit are negatively associated with stock ownership. Every one unit increase in satisfaction with pay scores decreases the probability of investing in stock by 1.6%. Moreover, as predicted, satisfaction with hours of work increases the probability of stock market participation with a magnitude similar to that of satisfaction with pay. Satisfaction with job stability stands out as the most influential determinant among all job satisfaction aspects: one unit increase in satisfaction with job stability scores increases the probability of investing in stock by 3.4%. Satisfaction with job security is also positively correlated with stock investment involvement, as predicted. Finally, satisfaction on relationships with co-workers shows no correlation with stock market participation.

The results above persist when more control variables are included, as shown in the results of the robustness check regressions in Table 4-2, Panel B. The magnitudes and confidence levels of the pay-content effects increase when the absolute level of

labour income is controlled. This disentangles the effects of objective and subjective income. Moreover, as predicted, satisfaction with hours of work increases the probability of stock market participation, and this effect does not disappear even when controlling for a variety of traditional determinants. It is worth noting that these effects could be covered by the risk tolerance effect because they are both positively correlated with risk tolerance, which is not surprising. To sum up, all of the evidence provides support for the hypotheses.

Section 4. Conclusion

Like in developed countries, many households in China face the decision of whether to participate in stock markets or stay out of them. According to the CUHS, about 20% of Chinese households choose to hold some risky financial assets, or public equity, in their portfolios. The first study in this section adopts a standard approach (Campbell, 2006; Calvet, Campbell, & Sodini, 2006; Calvet, Campbell, & Sodini, 2009a; Calvet, Campbell, & Sodini, 2009b) and finds that Chinese stock owners can be characterized by individual- or household-level features that reflect the constraints and behavioural factors that are suggested by traditional theoretical models with extension with friction--for instance, demographic characteristics such as age, gender, marriage and ethnicity; socio-economic characteristics such as wealth, income, education, industry and city of residence; and behavioural characteristics such as risk preference, consumption preference, gambling preference, optimism etc. The findings are consistent with the theoretical predictions and evidence from developed countries.

I have investigated the stock market participation problem from the novel perspective of job satisfaction. In general, discontentment with one's job motivates stock investment activity. Specifically, dissatisfaction with pay is the most influential aspect of job satisfaction that induces stock acquisition. Satisfaction with job stability/security and satisfaction with hours of work boost the probability of households participating in the stock market. These results support the theoretical prediction of the prospect theory and the theories regarding background risk and participation cost.

However, this study may have several limitations. First, the data are cross-sectional, and the regressions may suffer from some missing variables. Second, the theoretical model does not include the non-financial assets allocation problem. In reality, households' portfolios include not only financial assets and human capital, but also a number of other types of assets. Future studies may take these effects into account.

Chapter 5. Win or Lose: Individual Stock Investment Performance

Section 1. Introduction

In the previous chapter, I investigate which Chinese households participate in and which stay out of the stock market. The next natural question to ask is which of those participating households are the winners and which are the losers? This study investigates what investor characteristics affect individuals' stock investment returns, with an emphasis on the role of information screening preferences (ISPs).

Some investor characteristics are found to contribute to investors' stock portfolio return performance; for instance, wealth, education level, personality and features that bring information advantages. Some of these characteristics are also at work in investors' ISPs and behavioural biases, which affect performance directly. For example, the propensity to highly value the views of one's peers or grapevine news is associated with the under-diversification and disposition effects, both of which take a toll on investment return performance. Interestingly, when high wealth, high education, more confidence, rational behaviour and outperformance are aligned, managers in China are found to particularly favour grapevine news when making stock-investment decisions, although the educational level of managers is significantly higher. This may result from managers' overconfidence in being able to access insider information, which is rooted in the market imperfection in China.

This study has at least two important implications for financial education and market efficiency studies. First, identifying the traits of vulnerable groups is undoubtedly a necessary step before policies can be designed to cater for them. This is important for social equality and social welfare as a whole. Identifying the traits of potential losers also makes it possible to improve the investment performance of vulnerable groups. Vulnerable groups can become better off if they are aware of their vulnerability in advance and take action to overcome their intrinsic difficulties. For example, the findings suggest that female investors are more likely to underperform as a result of their reluctance to cut their losses. Financial education programmes should cater for this rule by trying to alert women to this disposition effect. Second, whether losers

are irrational is an important question that cannot be answered without knowing their characteristics, preferences and behaviour. If the behaviour of underperforming stock market investors not only harms their own benefits but also undermines market efficiency, the task of identifying their features would be of significant importance for asset pricing studies.

The remainder of this chapter is organised as follows. In Section 2, I investigate the determinants of stock investment return performance. I propose the hypotheses derived from a theoretical analysis and then test them in empirical regressions. In Section 3, I investigate the role of information screening preferences. I first investigate the correlation between ISPs and investor characteristics, with an emphasis on the variables identified as IP determinants in the previous section. Next, I analyse the correlation between ISPs and investor mistakes. Then I discuss the effect of ISP on IP. Finally, Section 4 concludes.

Section 2. Determinants on Individual Stock Return Performance

I. Hypothesis

Which factors contribute to individual investors' expected returns on their stock portfolios? According to stand portfolio theory, if a stock portfolio is optimal, only the investor's specific risk preference and constraints matter. Risk preference is shown to be associated with individual characteristics such as gender and wealth. Constraints usually result from information asymmetry, which is related to investors' access to information and the ability to access useful information. In this context, we should expect risk tolerance preference, gender, wealth, education level and other variables that contribute to information cost to play a role in individual stock investment performance. Alternatively, investors may fail to optimise their portfolios by making mistakes such as exposing themselves to specific risks rather than fully diversifying, inappropriately keeping losers rather than rebalancing and so on. These investor mistakes contribute to the under-performance of investments. Therefore, we should also expect investors' behavioural biases to affect their stock investment performance. In sum, according to theory, I hypothesize that factors associated with investors' risk preferences, constraints and behavioural mistakes will be correlated

with stock investment performance, which is represented in the following descriptive model:

$$AR_i = \beta_0 + \beta_1 Risk_tolerance + \sum_{m=2}^M \beta_m Constraint_{mi} + \sum_{n=M+1}^N \beta_n Mistake_{ni} + \varepsilon_i$$

AR: expected annual return of individual investor's stock portfolio

Risk tolerance: investor's risk tolerance level

Constraint: factor revealing investor's constraint when optimizing stock portfolio

Mistake: investor behavioral bias that diver him/ her from optimization

In the dataset, risk preference is measured by respondents' self-reported attitude to risk. According to standard theory, it is expected to positively correlate with expect return; therefore,

Hypothesis I: $\beta_1 > 0$

Regarding constraints, it is clear that having limited information is an important resource. Several variables in the dataset reveal individual heterogeneity with respect to information accessibility, such as city of residence, working industry and access to the Internet, and information costs such as education level, financial knowledge and so on. The more constraints an investor has, the lower his/her expected return will be.

Hypothesis II: $\beta_m < 0$

Investors may make mistakes that are detrimental to their performance. Two variables in the dataset roughly measure two common mistakes: under-diversification and the disposition effect. The hypothesis predicts that the extent of the investment mistake will be negatively correlated with return performance.

Hypothesis III: $\beta_n < 0$

II. Measuring individual stock investment performance

The dependent variable of interest is individual stock investment performance. The dataset provides the non-risk-adjusted holding period return rates for individual stock investments during two sample periods. Sample period I covers the 6-month period from March to September 2009, and sample period II covers the 3-year period from

October 2006 to September 2009.

The holding period return rates are the paper return rates for the two sample periods, respectively. Specifically, the holding period return rate for sample period I is named HPR_1 and that for sample period II is named HPR_2 . The values of the shares in households' stockholdings at the time of the survey are also available in the data set, which enables us to distinguish not-reported HPR_1 values from zero HPR_1 values in households with no stockholdings.

Of the 10,043 survey respondents, 2,030 reported either their HPR_1 or HPR_2 , or both. Forty-two investors were newcomers to the stock market within the last half year. I exclude these new stock market participants and restrict the sample to those who reported at least 3-year-period return rates. This restriction, which does not materially change the results, prevents the distribution from being unduly influenced by investors whose returns are driven by only a few months of realisations. Moreover, 86 investors who had previously invested in stock had quit the market for at least 6 months. The HPR_1 value for these householders is zero because holding zero shares is also a state of stock investment. As borrowing is uncommon in China, I exclude 10 observations with HPRs of less than -100% to avoid the results being influenced by potential measurement errors. This restriction also causes no material difference to the findings. Finally, there are 1,906 observations for HPR_1 and 1,980 observations for HPR_2 .

The annualised return rate is then computed based on HPR_1 and HPR_2 and labelled as AR_1 and AR_2 , respectively. Moreover, I create two dummy variables, 'Loser₁' and 'Loser₂', to indicate whether an investor loses money in sample period I and sample period II, respectively. In the 6-month period, 51.52% of investors lost money compared with 65.61% in the 3-year period. The details of these IP measures can be found in Appendix 3, Panel D and the descriptive statistics are reported in Table 3, Panel B. Meanwhile, Figure 3 and 4 plot the distribution of them.

III. Regression Result

Panel A of Table 5-1 reports the regression of IP on a variety of potential

determinants of return performance. In columns (I) the dependent variable is AR_1 and in columns (II) it is AR_2 . AR_i refers to the annualised non-risk-adjusted return performance of investors' stock portfolios during the sample period, i . For the independent variables, I include all available factors that may be related to investors' risk preferences, information constraints and abilities. Detailed variables concerning investors' employment status, job position, industry and city of residence are controlled for but not reported in the table to save space.

Many variables contribute to investor constraint. It is widely accepted in the literature that the amount of an individual's total assets is positively linked with his/her access to information and negatively associated with information cost. The wealth effect is significant in both regressions in Table 5-1, Panel A. In sample period I, every 100 thousand increase in total asset value leads to a 7% rise in the annual expected return. The wealth effect is not significant in sample period II when the stock market is highly volatile and far from efficient. Ethnicity and education level are also related to investor constraint because they contribute to information asymmetry or information cost heterogeneities. Education level is positively correlated with IP, and the higher investors' educational attainments, the higher their average IP in both sample periods. Notably, university graduates achieved 15.69% higher annual return rates in sample period I than investors with a lower than high school level of education. This difference is significant at the 5% confidence level.

It is notable that in an unreported regression, similar to that in Table 5-1, Panel A column (I) but without controlling for investor mistakes, female investors earn 6.35% less AR_1 than males. The effect is significant at the 10% confidence level. This effect is almost as high as a 10,000 RMB decrease in household total assets. The coefficient for female is also negative in sample period II, although it is not significant. This implies that female investors are vulnerable in terms of return performance as a consequence of their propensity to make mistakes. Ethnic minority investors seem to gain less than Han investors, but the effect is significant only in sample period II.

The coefficient of Risk Tolerance in model (I) is significantly positive, indicating that the more risk an investor is willing to take, the higher his/her return rate on average.

This evidence is consistent with the hypothesis. This effect is not significant in sample period II, when the stock market was volatile during the global financial crisis. This is an abnormal phenomenon: even risk taking was not compensated by a risk premium, which implies that the stock market in China during the financial crisis seriously lacked efficiency.

I also include all of the job satisfaction measures in the regression to see if they have any influence on stock market investment performance at all. It turns out that they are all insignificant. Such a finding is perhaps not surprising as job satisfaction measures are intended to capture barriers to participation, such as background risk or participation cost, which are not theoretically predicted to be correlated with performance. There is, therefore, little reason to assume that investor behaviour and performance are subject to the same causes as stock investment involvement. In sum, although job satisfaction plays a role in stock market participation, its correlation with investment performance is theoretically ambiguous and empirically insignificant.

Theoretically speaking, under-diversification and keeping losers are biased forms of behaviour that lead to under-optimal performance. In China, these two so-called mistakes do indeed harm investors' return performance. The under-diversification effect is represented by the product of the number of equity holdings in the portfolio, minus one. The lower the number of stocks included in the portfolio, the lower the expected return on the portfolio. The question, 'Do you use a cut-loss strategy when trading shares, i.e. sell a share when its price drops below a certain level and the market prospects for this share are not good?' roughly reflects the disposition effect. Respondents chose one of three response options: 'Execute it strictly', 'Execute it occasionally' or 'Never do'. The 'Execute it strictly' option reflects the lowest level of disposition, and 'Never do' reflects the highest level. The regression results show that for every one point increase in Disposition Effect, the expected return drops by about 12% in sample period I and 3% in sample period II. Both effects are significant at the 1% confidence level.

In sum, all of the empirical evidence supports the above hypotheses: high risk

tolerance is associated with high expected returns; greater constraints resulting from less access to information or higher information cost decrease expected returns; and making investment mistakes harms return performance.

IV. Self-selection bias argument

In the regressions above, only about 20% of the observations in the sample are included because the rest of the households do not participate in the stock market at all. If households chose not to invest stock because they believed that they would perform badly in this market, the sample of observed IP may suffer from selection bias. Therefore, it is necessary to check whether and to what extent such a selection bias may affect the results. For this, the Heckman selectivity model is used.

For the first step in running the Heckman selectivity model, valid instrumental variables are required. These IV should qualify as determinants of stock market participation but not of investment performance. Variables relating to job satisfaction seem to be good candidates. As discussed in the previous chapter, job satisfaction in general affects stock acquisition. It was also noted that one of the main reasons that job satisfaction plays a role in stock market participation is its association with background risk. However, there is no reason to believe that people with low background risk should necessarily perform better in the stock market. In fact, the results shown in Table 5-1, Panel B clearly indicate that several job satisfaction variables are indeed associated with participation but not with performance. Hence, these can be used as valid instrumental variables for the Heckman selectivity model.

I specify the Heckman selectivity model as follows:

$$IP = \beta_0 + \sum_{m=1}^M \beta_m IP_determinant_{mi} + \mu_{1i}$$

IP is observed only if

$$\gamma_0 + \sum_{m=1}^M \gamma_m IP_determinant_{mi} + \sum_{n=M+1}^N \gamma_n Job_satisfaction_{ni} + \mu_{2i} > 0$$

where

$$\mu_1 \sim N(0, \sigma)$$

$$\mu_2 \sim N(0, 1)$$

$$\text{corr}(\mu_1, \mu_2) = \rho$$

the null hypothesis for no selectivity is:

$$\rho = 0$$

The results of the estimation of the Heckman selectivity model are presented in Table 5-1, Panel C. As can be seen, no matter whether AR_1 or AR_2 is used as the proxy for IP, ρ is never significantly different from zero. If the IV variables used here are valid, these results indicate that the selectivity bias is not a major concern in our data. Hence, the OLS results can be considered reliable.

Section 3. Information Screening Preference and Individual Stock Return Performance

In the previous section, I made an initial attempt to investigate how individual stock investment return performance is affected by a range of investor characteristics and behaviour, which are determinants established in literature. In this section, I try a new angle—the role of information screening preferences (ISPs) in IP. The estimations would be biased if the variables reflecting information screening preference are directly added into previous regression, when the multicollinearity problem would be so serious that the coefficient of total assets inflates to about 200. Then to identify the exact effects of IPSs and their channels, in this section, I run the regressions of IP on information screening preference with and without controls, and carefully interpret the results.

I. Information Screening Preferences (ISPs)

In the survey, respondents were asked ‘How do you weight the importance of the following factors when you make investment decisions: personal experience; own analysis; consultants advice; peer opinion; or grapevine news?’ The results illustrate that preference for information resources is associated with some investor characteristics and is predictive of behavioural bias. Preferences for these information resources are likely to be associated with self-confidence. Intuitively, confident individuals tend to listen to themselves while unconfident ones are more willing to listen to others.

Specifically, ‘own analysis’ has the highest correlation with the objective ability to make correct decisions and the subjective confidence in such ability. Reliance on ‘personal experience’ also partly measures self-confidence. The implication of listening to ‘consultant advice’ is ambiguous now that the trustworthiness of consultants is doubtful, especially in China. Valuing ‘peer opinion’ is associated with the so-called peer effect, for which there is some evidence in the literature. Most previous studies claim that the peer effect is a behavioural bias that harms investment performance. Last but not least, listening to ‘grapevine news’ has mixed implications: it has the lowest correlation with stock analysis ability, yet it may also reflect confidence in one’s ability to access private information, which brings an advantage.

II. Information Screening Preference and Investor Characteristics

To investigate how Information Screening Preference is associated with investor characteristics, I regress this variable on a host of individual demographic and socio-economic characteristics. The results are reported in Panel A of Table 5-2. The constant and a variety of insignificant control variables are included in the regression but are not reported to save space. From the table, we can see that females have a significant preference for listening to other people, whether family member, friend or grapevine news, rather than trusting their own judgments. Gender is the only factor that is significantly related to personal investment experience. In sum, women appear reluctant to trust their own experience.

Wealthy investors prefer their own analysis and high-income investors distrust consultants’ views. Interestingly, the educational-level dummy does not have a consistent effect on information preference. The only finding is that investors with the highest education appear to be subject to the peer effect. A possible explanation of this phenomenon is that high-IQ investors interact more. Grinblatt, Keloharju, and Linnainmaa (2012) find that investors are more likely to herd with investors of a similar IQ than with investors of a dissimilar IQ. The opinions of average- or low-IQ investors vary considerably, whereas the opinions of high-IQ investors are more consistent: they exhibit superior market timing, stock-picking skill and trade execution.

I control a series of variables reflecting investors' information constraints or ability to exploit information: Financial Literacy Dummy, Financial Centre Dummy, Finance Sector Dummy and Internet Access Dummy. Unsurprisingly, these variables have opposite effects on the importance scores for 'own analysis' and 'grapevine news'. Residing in a financial centre increases the score for the importance of 'own analysis' by 0.125 points and decreases that for 'grapevine news' by 0.107 points on the five-point scale. Those with the basic knowledge that a 'Financial crisis has ever happened in history' value 'own analysis' 0.212 points higher and 'grapevine news' 0.207 points lower than those without such knowledge. Working in the finance sector increases the importance score for 'own analysis' by 0.334 points and having access to the Internet at home decreases the importance score for 'grapevine news' by 0.127 points.

Interestingly, managers, professionals and entrepreneurs rate the importance of grapevine news 0.407 points higher and that of their own analysis 0.244 points lower, reflecting their belief that they have advantages in access to private information.

The five information screening preferences can be categorised into two groups: listening to self and listening to others. The difference between these two groups may reflect investor confidence. I construct a variable, 'Confidence', indicating whether investors prefer to listen themselves or to others when making financial decisions. The dummy value is set to one for those who value their own analysis or past investment more than each of the external information resources: consultant, family and friend, and grapevine news.

I construct a new model by replacing the dependent variables in the regressions in Table 5-2, Panel A with the dummy variable⁵, Confidence. Table 5-2, Panel B reports the regression of Confidence on the same independent variables as those in the Panel A regressions. The stepwise regression identifies five variables that have statistically significant associations with the Confidence dummy. The variables reflecting wealth,

⁵ The dummy variable Confidence takes the value of 1 when the highest score among all five types of information resource is for either Personal Experience or Own Analysis, and 0 otherwise.

easier access to information and stronger ability to use information are positively correlated with the probability of trusting ones' own views. Investors in management positions are more likely to listen to others' views, which may be due to managers favouring grapevine news, as discussed above.

III. Information Screening Preference and Investor Mistakes

How is information resource preference associated with investor behavioural biases? In Table 5-3, Panel A, I report the cross-sectional correlations between preferences and behavioural factors. Personal Experience Preference and Own Analysis Preference are both positively associated with willingness to execute the rational cut-loss strategy. The correlation coefficients of these variables with Disposition Effect are -0.05 and -0.06, respectively, significant at about or less than 1% confidence level. Those who are subject to the peer effect also appear to be subject to the disposition effect, as indicated by the highly significant correlation (0.101) between Peer Opinion Preference and Disposition Effect. Under-diversification is correlated with Investment Experience Preference, but only at the level of 10.4%. This implies that the more investors value their own investment experience, the more likely they are to diversify their stock portfolios. To summarise, some information preferences in favour of own opinions are found to be associated with rational investment strategies and some preferences in favour of others' opinions are associated with investor mistakes.

To confirm the above conclusion, I perform a t test on group differences for Under-diversification and Disposition Effect with respect to the Confidence Dummy. The results are shown in Table 5-3, Panel B. The difference in the Disposition Effect between the listen-to-self group (Confidence Dummy=1) and the listen-to-others group (Confidence Dummy=0) is significant at the 1.9% level. The difference in the Under-diversification is almost significant, with a p-value equal to 11.2%.

IV. Information Screening Preference and Stock Investment Performance

To investigate the relationship between information screening preferences and stock investment performance, I adopt three groups of models to estimate the effects. They are as the following:

Model (I) and (IV):

$$AR_{ti} = \beta_0 + \sum_{m=1}^M \beta_m ISP_{im} + \varepsilon_i$$

Model (II) and (V)

$$AR_{ti} = \beta_0 + \sum_{n=M+1}^N \beta_n IM_{in} + \varepsilon_i$$

Model (III) and (VI):

$$AR_{ti} = \beta_0 + \sum_{m=1}^M \beta_m ISP_{im} + \sum_{n=M+1}^N \beta_n IM_{in} + \varepsilon_i$$

AR refers to the expected annual return of individual investors' stock portfolios, ISP refers to information screening preference and IM refers to the determinants of IP identified in the previous section; t takes the value of 1 or 2 to indicate sample periods I and II.

The results of the regressions clearly show that investors with greater trust in themselves earn more in terms of their stock annual return rates, as reported in Table 5-4. As shown in Panel A, all of the coefficients for information screening preferences in favour of own opinion are positive in all of the models, and all those in favour of others' opinions are negative. Specifically, one unit increase in Own Analysis Preference is associated with a 5.05% higher return rate in AR_1 , which is an impressively large effect. In contrast, a one unit increase in Peer Opinion Preference is associated with a 0.76% lower return rate in AR_2 . Table 5-4, Panel B provides an even clearer picture: the effect of the Confidence Dummy is consistently positive across models and sample periods.

Overall, what can be concluded about the information screening preference effects? Are they new, independent and fundamental determinants of IP, or are they merely the results of the previously identified IP determinants? Table 5-2 already shows that ISP is correlated with some investor characteristics, and, in an unreported regression,

preferences for personal investment experience and own analysis are positively and significantly correlated with risk tolerance. As shown in Table 5-4, Panel A, in sample period I the effects of ISP, Risk preference, Education and Wealth are significant in models (I) or (II). But in model (III), the first three ones simultaneously disappear and t value of Total Asset is seriously inflated. The situation in sample period II is similar. Given these findings, it is safe to reject the possibility that the ISP effect is independent. Investors with greater wealth and higher levels of education and risk-tolerance are more likely to trust themselves when assessing the importance of information according to its source, and thus achieve better return performance. Their outperformance is partly attributed to making fewer investor mistakes, which is partly due to their information-screening preference.

Section 4. Conclusion

The main findings in the current chapter are as follows. First, as predicted by standard theory, variables reflecting investor constraints and mistakes influence individual stock investment performance. Regarding investor constraints, I find that the more constraints an investor is subject to, the lower the return rate on his/her stock portfolio. Poor, less-educated and intrinsically nervous investors underperform significantly, which I argue is because these investors bear higher information costs. Moreover, two so-called ‘investor mistakes’ indeed undermine stock investment outcomes, as predicted by theory and recognised in the literature. In addition, evidence from the April to September 2009 period shows that high risk tolerance was accompanied by high returns, but this was not the case for the October 2006 to September 2009 period, during which the market was very inefficient.

Second, I study investor performance from a new angle, preference for information screening with respect to resources, and find that investors who rely on their own analysis when making trading decisions earn more. Specifically, preference on own investment experience, own analysis shows positively correlation with investment performance and trust on view of financial consultants, family or friends, and grapevine news are negatively associated with individual stock investment performance, although not all the correlations are significant. The self-trusting investors are usually wealthier, have more financial knowledge and are more likely

to be male. Evidence regarding their behavioural biases shows that they are less vulnerable to the disposition effect. These findings imply that agents with more information constraints are less capable of making trading decisions by themselves; consequently, they listen to others and make more mistakes. It is interesting that people in managerial positions tend to trust grapevine news, a preference for which is actually negatively correlated with IP, although not significantly. A possible explanation is that managers in China are overconfident in their ability to access insider information. Such a belief or the illusion of owning privilege is deeply rooted in Chinese culture today.

Admittedly, this study has some limitations. In particular, underperformance in only two periods is not enough to prove the consistency of effects across time. Therefore, I would expect to use panel data for future research. As for future studies, the findings in this chapter ignite my interest in investor rationality, which is a more complex topic. Is stock ownership necessarily rational? I believe that rational behaviour could be specific to individuals. If certain groups of individuals are highly likely to lose out on stock investments, then shunning the stock market could be a rational decision for them: gaining a low positive return rate is better than a negative return rate. In short, I hope to contribute to the normative household finance literature by seeking reasonable criteria for investor rationality in my future work.

Chapter 6. Trait Anxiety Effect

Section 1. Introduction

It is not unreasonable to claim that personality can affect investor performance. Theories in personality psychology have long demonstrated that personality traits such as neuroticism can affect human performance. Indeed, a large body of existing research has identified a negative correlation between neuroticism/anxiety and job performance (Tett, Jackson, & Rothstein, 1991; Salgado, 1997). Accepting that investing in stocks is as cognitively demanding a task as performing a job, it is intuitive to hypothesize that a facet of trait neuroticism, trait anxiety, can also influence individual stock investment performance. However, empirical evidence is needed to verify this hypothesis.

The study of the link between trait anxiety (TA) and investment performance (IP) can contribute to the existing literature in the following three ways. First, in recent years, there has been a surge of studies in behavioural finance that have examined the effects of inherent individual heterogeneity on financial performance. For example, several recent studies have investigated to what extent particular factors related to personality such as genetic makeup, IQ, cognitive ability, sociability and trust can affect stock investment behavior or performance (Barnea, Cronqvist, & Siegel, 2010; Kaustia & Knüpfer, 2012; Grinblatt, Keloharju, & Linnainmaa, 2012). It is therefore worthwhile to explore the association between a specific personality trait and financial performance. Second, the finding that some personality traits are associated with stock investment performance is potentially important for the emerging household finance literature. This branch of the literature holds that how well individuals or households invest in financial markets has important implications for their own welfare and for the welfare of society as a whole (Campbell, 2006). Hence, establishing that certain personality traits can affect the performance of financial investments can help us to identify the potentially vulnerable groups and consequently enable the design of suitably targeted public policies. Third, this study makes an innovation in methodology. Psychologists have been studying individual personality traits for a long time and have developed many useful theories and

collected much empirical (often experimental) evidence. Some of the theories relating to personality traits can help us to better predict individual behaviours, including those related to financial activities. Hence, introducing these theories to the finance or economics field will certainly help us to better understand the individual heterogeneities in financial/economic questions.

Measure of trait anxiety (TA) is needed to assess whether TA actually affects individual stock investment return performance (IP). Large sample data on TA is rare, not mention it has to be accompanied with a host of variables about investor characteristics, preferences, behaviors and performances. However, as aforementioned, I use a unique dataset. An important advantage of this dataset is that it was collected immediately after the outbreak of the global financial crisis (GFC). The participants in the survey were asked questions on their subjective feelings about the GFC (state anxiety or SA) and on the effects of the GFC on their income, wealth, work pressure and job security (stimuli for SA). Hence, using the GFC as a natural experimental setting, the data enabled us to develop a good measure of the extent to which someone is more or less prone to anxiety. I believe this measure is a good proxy for TA because it is conceptually consistent and performs well empirically in all of the validity check tests.

My main finding in this chapter is that the proxy for TA is significantly negatively correlated with IP, as predicted in theory. Furthermore, the robustness check rules out the probability that this association is due to reverse causality. I also find that the result holds after controlling for a long list of factors that may potentially affect IP. This suggests that PTA measures a fundamental personality trait that can affect a person's behaviour when performing a cognitively demanding task such as investing in the stock market. This finding has wide range implications for research in the fields of behavioural and household finance and economic psychology.

The rest of the chapter is organized as follows. In section 2, I construct the measure for Trait Anxiety and discuss its validity. Section 3 presents empirical regression of individual performance (IP) on PTA as well as the robust checks. Section 4 concludes the study.

Section 2. Theory

Psychologists have long established that anxiety impairs performance on difficult tasks (Eysenck, 1982; Saltz & Hoehn, 1957; Zeidner, 1998) and there is abundant evidence on the negative association between neuroticism or trait anxiety and job performance (Tett, Jackson, & Rothstein, 1991; Salgado, 1997). Furthermore, stock investment activity is a complex, highly cognitively demanding task, analogous to a job⁶. Given the above theories, evidence and facts, it is natural to conjecture that trait anxiety impairs stock investment performance. In this section, I introduce the theoretical background for this conjecture. The theories are mainly borrowed from psychology.

Anxiety and Performance

The mainstream studies in psychology linking anxiety and performance use a cognitive approach. The ‘cognitive pattern’ of anxiety has two aspects: performance impairment on cognitively demanding tasks, and selective attention towards threatening stimuli. Both of these clearly indicate that anxiety harms task performance when the task is difficult, especially when uncertainty is involved.

Psychologists find that anxiety impairs performance on cognitively demanding tasks. Eysenck and Calvo (1992) points out that anxiety about the task interferes with performance by overloading attention or working memory. Active working memory is one of the cognitive functions most sensitive to anxiety: worry-related processing uses up working capacity. In addition, Sarason, Sarason, and Pierce (1995) propose that anxiety may divert attentional resources from the task at hand to worry-related processing, resulting in an insufficiency of resources for the task at hand. Figure 5 presents an outline of this model. Attentional control theory (Eysenck, Derakshan, Santos, & Calvo, 2007; Eysenck & Derakshan, 2011) represents a major development of Eysenck and Calvo (1992) processing efficiency theory and it has become the most influential cognitive theory in this domain. The theory proposes

⁶ This intuition is consistent with the evidence from Chapter 4, Section 3, which implies that stock investment is an activity analogue to taking a job from the perspective of making a decision about participation.

that anxiety decreases attentional control and causes a disproportional allocation of cognitive resources. The theory assumes that anxiety impairs the efficient functioning of the goal-directed attentional system and increases the extent to which processing is influenced by the stimulus-driven attentional system (Eysenck, Derakshan, Santos, & Calvo, 2007).

Anxiety is also associated with a bias in selective attention and similar biases in judgment and reasoning. Individuals with high trait anxiety show a bias towards attending to threatening stimuli (Matthews & Harley, 1996; Egloff & Hock, 2001). In the context of decision-making, anxiety changes the way the person frames the problem and inappropriately allocates superfluous attention to threats and self-protective strategies (Nabi, 2003).

The above theories on cognition and attentional bias have important implications for individual investment performance. The ‘cognition’ stream claims that anxious investors have a shortage of cognitive resources when making trading decisions. In this context, anxious investors are less likely to optimise their utility and more likely to make mistakes, thus their investment underperformance is a natural consequence of under-optimisation. Meanwhile, risk aversion is a key parameter in portfolio theory, according to which investors choose the level of risk exposure that directly determines the expected return on their portfolios. However, investors are not necessarily capable of picking assets with their preferred risk level because risk aversion has two components – risk perception and risk attitude – and risk perception could be mistaken. In other words, what an investor perceives is not necessarily the same as the reality. As mentioned above, ‘attentional bias’ theories inform us that anxiety causes a negative perception bias; therefore, financial risks perceived by anxious investors should be consistently higher than the actual risks. Consequently, anxious investors take lower risks than they would prefer, and this is paired with expected returns lower than they would prefer. As a result, the returns on anxious investors’ portfolios are lower than they would be if they were not anxious.

Personality traits and facets

Anxiety could be a trait or state (Eysenck, 1982; Spielberger, 1966). In the current

study my interest is focused on trait anxiety because it is stable and thus can be used to predict future behaviour. Personality traits have power in predicting human behaviour and consequent performance. For example, those who score highly on the personality trait neuroticism are more likely to interpret ordinary situations as threatening and to interpret minor frustrations as hopelessly difficult. Their negative emotional reactions tend to persist for an unusually long time, which means they are often in a bad mood. In short, high neuroticism scores explain and predict a pessimistic approach towards work.

According to personality psychology, trait anxiety is a facet of the neuroticism dimension of the Costa and McCrae's 'Big Five' personality model⁷, which has become the most influential model of personality over the past few decades. Personality can be described at the primary and broader trait levels. Broader traits are often called dimensions or domains. Costa and McCrae (1992a) recognise five personality dimensions: neuroticism, extraversion, openness, agreeableness and conscientiousness. Neuroticism is the tendency to experience negative emotions such as anger, anxiety and depression. It is sometimes called emotional instability, and the converse is referred to as emotional stability. According to Eysenck (1968), neuroticism is associated with low tolerance for stress or aversive stimuli. Beneath personality traits, there are facets, which refer to specific and unique aspects of a broader personality trait. For the personality domain neuroticism, Costa and McCrae (1992a) introduce six constituent facets: anxiety, angry hostility, depression, self-consciousness, impulsiveness and vulnerability. The anxiety facet, i.e. so-called trait anxiety, reflects a stable predisposition or tendency to respond with state anxiety. In addition, facets in same dimension are proven to be in line with each other.

Anxiety Trait and State

Psychological theory on the relationship between trait and state anxiety is the basis of my methodology for constructing a proxy for trait anxiety, which is described in Section 3.

⁷ There are many versions of five factor model including lexical versions and questionnaire-based versions. Among them, Costa and McCrae's version is the most famous.

Figure 6 shows a simplified version of Spielberger (1966) state-trait model of anxiety proposed by Eysenck (1982) as an explanation for the effects of anxiety on performance. This theory clearly demonstrates that traits, together with situational factors such as external stressors, influence the state. Hence, given identical external situations, the variance in state anxiety should be explained by internal trait anxiety, which is heterogeneous in a population.

To sum up, from psychology theories direct to the proposition that trait anxiety negatively affects performance when the task is difficult, especially when uncertainly involved. In addition, these theories are supported by numerous empirical evidences. The most relevant one to my study is Salgado (2002), which shows how personality measured by the Five Factor model can influence the job performance of the financial service managers. They have one single scale for measuring global job performance and two separate measures for components of Job performance, job problem solving ability and job motivation. Their results show that Neuroticism negatively correlated with both the global measure of job performance and the two components. Other related empirical studies include Mueller and Plug (2006) who find emotional stability (low neuroticism) increase men's earnings. Neuroticism is also negatively associated with the wages of men and women in the Netherlands. (Nyhus & Pons, 2005).

Section 3. Measuring Trait Anxiety

The main objective of this study is to investigate the effect of personality trait anxiety on individual stock investment performance. Given the absence of trait anxiety scores obtained from formal psychological testing, I require a proxy variable that is conceptually close to the psychological term trait anxiety. For this purpose, I construct a variable named PTA that measures each investor's intrinsic propensity to feel anxiety, worry, fear or unease. I begin by estimating a model and then derive PTA from the residual of this model. Next, I test the validity of PTA as a proxy for trait anxiety.

I. Constructing PTA

According to Spielberger (1966) and Spielberger and Reheiser (2004), trait anxiety

(TA) is ‘a general predisposition to experience transient states of anxiety’ while state anxiety (SA) is defined primarily as a consciously perceived feeling of tension and apprehension. Inner trait anxiety interacts with External Stressor to determine state anxiety. The above can be translated into the following model:

$$SA = \text{External Stressor} + \text{Internal Trait Anxiety}$$

SA and a rich amount of data on variables relating to External Stressor are available in the dataset. This means that I can run a regression of SA on a set of variables that captures as many as possible of the observed stimuli for SA, and then use the residual of this regression as a proxy for TA.

In the first step I calculate each investor’s relative level of state anxiety using the survey questions on their feelings towards the 2007 global financial crisis (GFC). In the survey, respondents were asked how uneasy/nervous/worried/fearful they felt about the global financial crisis (See Appendix 2 Q9-1, Q9-2, Q9-3, Q9-4). As Cronbach’s alpha shows a high level of inner consistency in the answers to these four questions, I average the scores for the four questions into a single index, SA⁸, and use it as a proxy for state anxiety. In the second step, I run the regression with the following model specification and name its residual PTA or PTA2.

$$SA_i = \beta_0 + \left(\sum_{m=1}^M \beta_m \text{Causer}_{mi} + \sum_{n=M+1}^N \beta_n \text{Situation}_{ni} \right) + \varepsilon_i$$

Table 6-1 reports the results of the regressions. The dependent variable SA in both regressions is the scalar constructed using the Cronbach's alpha method from the group of scales⁹ measuring individuals’ unease, nervousness, worry and fear about the GFC, as described above. The scale reliability coefficient is 0.8666. The same independent variables are used in both regressions. I try to include as many variables as possible, as long as they represent objective effects and external situations and are not closely correlated with inherent personality, either theoretically or empirically,

⁸ For distribution of SA, see Table 3 Panel C and Figure 7.

⁹ See Appendix 2, Relevant Questions from the Household Survey on Financial Services Demand in China, Q9-1, 2, 3 and 4.

because controlling for environmental factors reduces the noise from external factors in the residual. Problems such as heteroskedasticity and multicollinearity should not be a concern as they will not undermine the consistency of the estimation. In this context, as long as a variable is not correlated with trait anxiety and carries some information about the external environment, it is included in the regression. Finally, about 60 variables are included, measuring the effect of the GFC on substantial items, demographic characteristics except gender, socio-economic status, financial knowledge and how respondents weighted the importance of nine considerations when answering the survey. Details of the independent variables are provided in Appendix 3. Note that I do not include *Female* and the measure of IP in the model, because gender is correlated with neuroticism (Lynn & Martin, 1997), and IP is assumed to be correlated with TA.

Both a median regression model (Specification (I) Quantile regression) and a mean regression model (Specification (II) OLS regression) are used to construct the proxy variable for trait anxiety, named PTA and PTA2, respectively. Comparing the models, I find that PTA is more desirable for three reasons. First, the quantile regression model is a least-absolute-value model. As the absolute value of distance is my focus, it is conceptually superior to the least-squares-value model for my purpose. Second, the quantile regression estimates are more robust against outliers in the response measurements. Third, in the following section, which reports the external validity and endogeneity tests, PTA performs slightly better than PTA2. Nevertheless, the evidence from the above tests illustrates that the model specification does not make any material difference to the findings. In this context, I report both regressions for SA in Table 6-1, and in the following sections, I only report the PTA regressions.

It is clear that PTA measures whether an individual's state anxiety about the GFC is higher/lower than that of the median, other things being equal. It measures an individual's relative level of anxiety compared with that of other individuals in the same situation. Consistent with the sample size used for the regression in Table 6-1, the PTA sample comprises 9,218 observations. The distribution of PTA is graphed in Figure 8, with the normal distribution curve for reference. The median of PTA is around zero while the mean is not, because the quantile regression is estimated by

minimising the sum of the squared distance of observations to the conditional median. More specifically, the moments of PTA are as follows: mean 0.002, variance 0.474, skewness -0.015 and kurtosis 3.484.

II. PTA as Proxy for Trait Anxiety

In regression examining the relationship between this intrinsic personality trait and personal investment outcome, how well could PTA serve as a proxy for trait anxiety? To be a good proxy, the variable PTA has to satisfy two assumptions:

$$PTA = TA + v \quad (1)$$

$$Corr(v, IP) = 0 \quad (2)$$

First, the correlation between PTA and TA should be positive and strong; otherwise, PTA does not measure TA. Second, Noise should not be closely correlated with investment performance; otherwise, the effect of TA on IP will be unidentifiable due to the reverse causality problem. Hence, I conduct a validity check on assumption (1) and an endogeneity check on assumption (2).

Validity check

One way of showing how much PTA reflects true TA is to examine how PTA is correlated with a wide range of other proxies for neuroticism. According to the Five Factor Model (Costa & McCrae, 1992a; McCrae & Costa, 1999; McCrae & John, 1992) of personality, neuroticism is one of the trait dimensions of personality, which can be further subcategorised into several facets, one of which is trait anxiety. Those facets should be correlated with each other in a certain direction. For instance, if a person scores highly on anxiety (tense), s/he is much more likely to score highly on other facets of neuroticism, such as vulnerability (not confident), depression (not contented), impulsiveness (moody), angry hostility (irritable) and self-consciousness (shy). Furthermore, theories on neuroticism and numerous empirical studies indicate that neuroticism is negatively correlated with optimism, which is also testable given the data.

The informative dataset contains 19 variables that are intuitively expected to be

related to neuroticism. I run a regression of PTA on all 19 variables. The sign of the regression coefficients on each of these 17 variables is the same as the theoretical prediction, and 15 of the 17 coefficients are statistically significant. For details, see Table 6-2, External Validity Check on PTA, which summarises the results from 15 regressions of a variety of dependent variables on PTA. Now let us take ‘Satisfaction with Interpersonal Relationships’ as an example. Intuitively, interpersonal relationships with co-workers should not have a direct correlation with the effects of the global financial crisis. However, according to personality psychology, people’s subjective feelings about both relationships and the GFC depend on an individual’s personality: for the former, the higher a person scores on the depression facet of neuroticism, the less satisfied he or she should be; for the latter, the higher a person scores on the anxiety facet of neuroticism, the more he or she should feel anxious about the GFC. Psychological theory informs us that facets of neuroticism are consistent; therefore, a person who scores high on the depression facet will usually also score high on the anxiety facet. Therefore, if PTA is a good proxy of TA, we should find that higher PTA scores are associated with less satisfaction with interpersonal relationships with co-workers. As shown in Table 6-2, this prediction is supported by the regression results for ‘Relationships with co-workers’. The coefficient is -0.0234, with a t-statistic as large as -2.14. In summary, this evidence provides no reason to doubt the validity of PTA, and neither does the evidence from the other 14 regressions. From the results of all 15 tests, I have strong evidence to confirm that PTA is a valid proxy for trait anxiety.

Endogeneity check: Structure among groups

From Section 3.1, we know that PTA is derived from state anxiety. In this context, it is natural to question whether PTA is sufficiently distinct from state anxiety. Theoretically speaking, state anxiety could be subject to IP, but trait anxiety should be absolutely exogenous; in other words, assumption (2) must stand. Recall the assumptions:

$$PTA = TA + v \quad (1)$$

$$Corr(v, IP) = 0 \quad (2)$$

If the correlation between v and IP is highly significant, then PTA is not a suitable proxy for TA because of the reverse causality problem. Luckily, proof by contradiction can help us to verify assumption (2), although v is unobservable: if v , namely the noise within PTA, is correlated with IP, then there should be a significant group difference in PTA between the stockowner group and the non-stockowner group because during the GFC, about 80% of stock investors lost money. Given this additional stimulus, the SA of stockowners should be higher than that of non-stockowners, other things being equal. In fact, the empirical evidence shows that the group difference in SA is significant at the 1% level (t value = -2.6106). In this context, if PTA contains a noise component that is subject to IP, then PTA should exhibit the same group difference as SA. On the contrary, if there is no group difference in PTA between stockowners and non-stockowners, the noise in PTA cannot be closely related to IP. Then, PTA can serve as a proxy for TA without worrying about the endogeneity problem.

To sum up, the decision rule is as follows:

If $\text{Corr}(v, \text{IP}) \neq 0$,
then $E(\text{PTA}|\text{stockowner}) \neq E(\text{PTA}|\text{nonstockowner})$
This is equivalent to:
If $E(\text{PTA}|\text{stockowner}) = E(\text{PTA}|\text{nonstockowner})$,
then $\text{Corr}(v, \text{IP}) = 0$

One-way analysis of variance shows that the group difference in PTA between stockowners and non-stockowners is not significant even at the 10% level, and the t value is as small as -1.5877. Therefore, we cannot reject the null hypothesis that stockowners and non-stockowners do not differ with respect to their PTA score. More formal tests can be found in Table 6-3. An OLS regression of PTA on the Stock-owner Dummy shows an insignificant coefficient with a t -statistic of only 1.21. To conclude, I find no evidence against Assumption (2).

Recall that I construct two proxies for individual trait anxiety, PTA and PTA2, from a quintile regression and an OLS regression of SA on a host of situational variables. So far I report the validity check and endogeneity check on PTA. Actually, the

corresponding checks on PTA2, are also found to be valid and exogenous, although not as good as PTA. To save space, I do not report them.

III. PTA Dummy Group

Expect for PTA and PTA2, I also construct a group of dummy variables reflecting TA, which are constructed basing on PTA score. A full description of SA and all proxies for TA are summarised in Appendix 3 Panel F.

Using one standard deviation from the mean of PTA as the criterion, I divide all respondents into three groups. High PTA (HTA) group individuals have PTA scores at least one standard deviation higher than the PTA mean; therefore, a typical HTA group member could be described as an emotionally nervous person. Low PTA (LTA) group individuals have PTA scores at least one standard deviation lower than the PTA mean; therefore, a typical LTA group member could be described as an emotionally stable person. The scores of the remaining individuals are between those of the HTA and LTA groups and are categorised as the Middle PTA (MTA) group, which serves as the reference group. HTA, LTA and MTA are dummy variables, coded as 1 to indicate if an individual is a member of the High, Low or Middle PTA group, respectively.

VI. Distinguish trait anxiety from risk aversion

In economics, risk aversion is a well-established term that refers to investors' willingness to take risk for a risk premium. It is a revealed preference, measured as the additional marginal reward that an investor requires to accept additional risk in modern portfolio theory. Trait anxiety is a psychological term that captures an individual's propensity to feel anxious, nervous, fearful and worrisome. From their definitions, these two concepts do not appear to be the same. However, it may be argued that there are substantial overlaps in the underlying aspects of human nature they are intended to capture.

Previous studies have established that risk aversion is correlated with wealth, income, gender and education level. In contrast, trait anxiety is an intrinsic personality trait

and should be independent from external factors, according to the Five Factor Model of personality (Costa & McCrae, 1992a; McCrae & Costa, 1999; McCrae & John, 1992). Thus, I hypothesise that the proxy for risk aversion and TA should be correlated and uncorrelated, respectively, with demographic measures and financial characteristics.

For evidence on the similarity/difference between trait anxiety and risk aversion, I ran the three regressions shown in Table 6-4, where risk aversion is measured by the survey respondents' self-reported preference among risk-return pairs, and trait anxiety uses PTA as a proxy. Column (I) reports the regression of risk aversion only on PTA. The results indicate no significant correlation between these two variables. Both the estimated coefficient and R square are close to zero. Column (II) also reports a regression of risk aversion on PTA, but this time with a host of control variables that are possible determinants of risk aversion based on the existing literature. Consistent with the theoretical prediction, seven variables show significant correlations with risk aversion with the correct signs, implying that having a higher income, more knowledge or information and a more diversified background risk effectively decrease an agent's level of risk aversion. However, the coefficient on PTA remains insignificant. In Column (III), I use PTA as a dependent variable. In this regression, apart from age (which exhibits weak correlation), none of the other variables show an association with PTA.

To summarise, although it seems intuitively plausible that trait anxiety should be closely related to risk aversion, the evidence here shows that it is neither a proxy for risk aversion nor a variable closely correlated with risk aversion.

Section 4. Effect of TA on IP

I. Regression Results

I investigate the paper return performance for each investor's stock portfolio by estimating cross-sectional regressions with the trait anxiety proxies and controls as explanatory variables. In Table 6-5, Panel A, PTA is used as a proxy for TA, while in Panel B the HTA, LTA MTA dummy variables are used, with MTA as the

reference group. In both panels, the dependent variables are measures of the sample period performance of each investor's stock portfolio. Specifications (I) and (III) in both panels are for sample period I, from April to September 2009, and Specifications (II) and (IV) are for sample period II, from September 2006 to 2009.

The regression results in Panel A reveal that PTA is negatively associated with performance. For example, the annualised return rate in sample period I is reduced by -9.90% per year for each one unit increase in PTA, which is measured on a scale ranging from -2 to 2 with an approximately normal distribution. In an unreported regression of HPR_1 , the corresponding 6-month HPR is reduced by -3.46%. For each one-unit increase in PTA, the probability of losing money in this 6-month sample period increases by about 11.9%. For the 36-month period covering the duration of the global financial crisis, I find similar effects from Specifications (II) and (IV). The annualised return¹⁰ from 2006 to 2009, namely AR_2 , is -1.36% lower for each unit increase in PTA, which increases the probability of losing money in this 36-month period by 12.1%. In sum, the effect of PTA about the GFC on stock portfolio return performance is consistently negative over the sample periods, and the magnitude of the effect seems to be time sensitive. Both the sign and the magnitude of the PTA effect on the probability of losing are almost the same in both sample periods. All of the evidence in Panel A implies that high TA reduces expected IP.

In Panel B, I estimate the precise difference in IP between the high TA (PTA at least one standard deviation higher than the sample mean) and low TA (PTA at least one standard deviation lower than the sample mean) investor groups, using the middle TA (PTA no more than one standard deviation from the sample mean) group as the reference group. I find that the AR_1 of the HTA group is -9.22% lower than that of the MTA group. Although the effect seems persistently negative, there is wide variation in its magnitude. In the 36-month sample period, this gap in AR is only -1.53%. In contrast, a calm predisposition appears to bring an advantage to LTA investors, whose IP is even higher than that of the MTA group. As a result, the gap between the annualised return rates of HTA and LTA investors is as large as 10.76%

¹⁰The corresponding holding period return in sample period II, HPR_2 , decreases by -3.55% for each unit increase in PTA.

per year in sample period I and 2.91% in sample period II. The probability of HTA investors failing to break even in both investment periods is not significant, but LTA investors have a significant, 14.0% lower probability of losing money in sample period I and 27.8% lower probability in sample period II.

There are several significant effects among the demographic and financial control variables. *Stock Portfolio Size* stands out as having the most significant and robust effect on IP. In both sample periods, a higher value of stock portfolio is associated with a higher IP and a lower chance of losing money. Nevertheless, although the sign of the Portfolio Size effect is persistent over time, its magnitude is as period sensitive as that of PTA. For example, every 100 thousand RMB of stockholding increases the expected annualised return rate by 6.30% in sample period I but only by 0.65% in sample period II. Although not in all specifications, Total Asset and Total Family Income are significant in most cases, and the positive slopes are consistent with the literature. Finally, female household heads seems to be vulnerable investors in the stock market.

All variables reflecting lower information constraints and higher ability to exploit information have positive coefficients, which makes sense. In particular, I include a group of dummy variables indicating respondents' education level: Below Secondary School Dummy, High School or Equivalent Dummy, Junior College Dummy, and University Dummy, with the first group used as the reference group. Some of these dummy variables exhibit significant effects. For example, in the 3-year sample period, compared to investors with lower than high school levels of education, those with a secondary school or equivalent level of education earn 1.76% more AR_2 and are 19.0% less likely to lose money. Those with a bachelor or above degree earn even more. In the 6-month sample period, their AR_1 is on average 11.15% higher than that of the least-educated investors. In addition, respondents' choices between the risk-return pairs are associated with IP, which is not surprising.

II. Robustness check

Subsample Regression

An argument against the findings reported in the previous section could be that investors with bad investment performance report high SA. As a variable taken from SA, PTA may not be clean enough to be free from the reverse causality problem. To check the problem, I run the same regression as that in Table 6-5, Panel A with a subsample that excludes those investors who weight the consideration of stock price as ‘important’ or ‘very important’ when reporting SA-relevant issues. As shown in Table 6-6, Panel A, this rigid limitation on observers brings no material change to the results. In the limited sample with only 1,243 (1,307) stock investors who are little suspicious to endogeneity, the regression of AR_1 (AR_2) and $Loser_1$ ($Loser_2$) produces the same sign for all of the coefficients as for their counterparts in full sample. Although there are some changes in the significance levels, the smallest absolute t-statistic among all specifications is 2.36 and it is still significant at the 5% significance level. To conclude, this check demonstrates that the finding regarding PTA’s negative effect on IP is robust.

Regressions with Alternative Proxy for PTA

As mentioned in Section 2, I construct two proxies for TA: PTA is constructed from a quintile regression and PTA2 is constructed from an OLS regression. Now, I replace PTA with PTA2 and run the same regressions as in Table 6-5, Panel A. The results are reported in Table 6-6, Panel B. Again, there are no substantial differences in the findings. For each unit of increase in PTA2, the annualised return rate in sample period I is reduced by -8.47% per year, and the corresponding annualised return rate in sample period I is reduced by -1.21%. These two coefficients are significant at the 1% level. For each unit of increase in PTA2, the probability of losing money in the 6-month sample period increases by about 10.2%, and in the 36-month sample period by about 11.0%. These two coefficients are significant at the 5% level.

Section 5. Conclusion

Using a natural experimental setting, I construct a proxy for trait anxiety, a facet of neuroticism that has long been established in the psychology literature to be

associated with low job performance. This proxy for TA is shown to have a negative effect on individual stock investment performance, and the robustness check confirms that such an association is not due to endogeneity or reverse causality.

The current study leaves many questions to be answered in future research. First, I have return rates for only two periods, which is not sufficiently strong to prove the TA effect. A future study using panel data will solve this problem. Second, I identify the effect of trait anxiety on IP, but provide little explanation of the channel. If trading records become available in future, I will analyse the details of investor trading behaviour to examine how high TA undermines their return performance. Third, underperforming investors should, theoretically, learn and improve their performance or quit in the long run. However, trait anxiety is an intrinsic part of personality that is stable in adulthood. Therefore, how TA-vulnerable stock investors behave in the long term is an interesting question. Such a study will require highly quality trading records.

This finding provides an example of how the use of psychological theory or the study of individual behaviour/personality can enrich our knowledge of finance and economics. The behavioural finance literature contains a variety of interesting correlations between everyday human behaviour and investment behaviour, but makes little attempt explain them. For example, Hong, Kubik, and Stein (2004) and Georgarakos and Pasini (2011) find that sociability contributes to stock market participation. This may be evidence for an association between financial behaviour and another personality trait, extroversion. The solid theoretical foundations available in the personality psychology literature can help us to understand and predict human behaviour, including financial behaviour.

Chapter 7. Conclusion

The household finance is an emerging new field in finance which studies how households utilise financial instruments to fulfill their objectives. The topic of household stock investment attracts more and more attention now as there are still many gaps between theory and empirics in this area. Previous studies on household stock investment find that the way some households use financial instruments is consistent with theoretical predictions, but some fail to do so and consequently suffer losses. The behaviour of the latter is therefore labelled as investor mistakes. The makers of such mistakes tend to have lower incomes and education levels, and are also more likely to be females or from ethnic minorities.

Campbell (2006) argues that investor mistakes are central to household finance studies. However, some of these so-called mistakes may be due to our lack of understand of household behaviors. Admittedly, given the complexity of financial planning and often confusing financial products, households inevitably make mistakes. However, to answer the question of whether any divergence from textbook theoretical behaviour is indeed a mistake, we need to know what is optimal for each household – knowledge that is not necessary fully taken into account from existing financial theories. In fact, so far we do not have a satisfactory normative theory that can tell us what households should do when contemplating stock market investments. Should households participate in or stay out of the stock market? The answer should be individual-specific, taking into account all transaction costs, opportunity costs and comparative utility with respect to non-stock-ownership. Should investors fully diversify their portfolios? The answer should depend on market efficiency, which has never been and could never be perfect. To sum up, from my point of view, the existing household finance theories are inadequate to support judgments about household rationality.

I believe two alternative directions of study to be promising: individual constraint and intrinsic heterogeneity. The first methodology still lies within the framework of standard theories, but pays more attention to the constraints that households are subject to. The second methodology is outside of traditional study setting and is informed by the fruits of other disciplines, particularly personality psychology. The

following represent some of the typical research questions that could be answered using these methodologies. First, how do the factors reflecting constraints affect household financial behaviour and outcomes? Various factors contribute to the constraints on households in the utility optimisation problem. Determining how these factors affect households' financial behaviour and consequent outcomes will provide a deeper understanding of both positive household finance and the application of normative household finance. Second, are there intrinsic heterogeneities responsible for individual investment behaviour and outcome? If there are, what are they and how do they take their effects? This series of questions is also very important. Individual heterogeneities are omitted in standard theories. However, if a heterogeneous characteristic is intrinsic and greatly influential, its effect on investment outcome can be so huge that ignorance of it will result in false theoretical predictions. For example, if a specific investor characteristic is doomed to make his/her stock investment seriously underperform and, as result, his/her utility from nonparticipation in the stock market would be bigger than that from participation, then investing in stock is an irrational rather than a rational choice for him/her.

With the emphasis on individual constraint and intrinsic heterogeneity, I designed a study on household finance using a unique dataset from China from three perspectives: stock market participation, stock investment performance and the effect of a personality trait on investment outcome. In the first two studies, which are intended to identify the determinants of stock investment involvement and outcome, I first recommend candidates for determinants by hypothesising the contribution of observable investor characteristics to optimisation constraints. For example, according to numerous studies on labour economics, education level and labour income are used as a proxy of ability, which is negatively correlated with the cost of information searching. Obviously, information cost is an important constraint in the portfolio optimisation model. In this context, I include education level and labour income in the empirical regression and hypothesise that they are positively correlated with individual stock market participation probability and expected return performance. The evidence is in favour of the hypotheses. In addition, I recommend other candidates that reflect the possibility that individuals fail to optimise. These independent variables are mainly proxies for behavioural biases. In the last study, I

newly identify a heterogeneity that is intrinsically embedded in human personality as a determinant of individual investment return performance. That is, trait anxiety is detrimental to stock investment performance. People who are prone to feel anxious, nervous, worried or uneasy are more likely to underperform with respect to their stock investments.

Apart from the above main studies, I also exploit the unique opportunity available from the informative database to conduct three ‘mini’ studies on the effect of job satisfaction on stock market participation, the effect of Chinese public employees’ satisfaction on stock market participation and the role of information screening preferences in stock market investments. The interesting findings are as follows. First, overall job satisfaction is negatively correlated with stock market participation. Dissatisfaction with pay and fringe benefit, and satisfaction with hours of work, job stability and security increase an individual’s willingness to invest in stocks. This evidence is consistent with standard theory, in that satisfaction status reflects marginal utility with respect to income, time cost and background risk exposure. The findings also imply that stock investment activity, which costs time and is expected to boost income, is analogous to taking a second job from the perspective of household labour. Second, as a Chinese characteristic, the public sector economy differs from other economies in several ways. Exploring the difference from the perspective of employees’ involvement in the stock market, I find that employees of public sector units are more likely to participate in the stock market, mainly due to their higher incomes and education levels. In addition, every feature of their job satisfaction is in favour of stock ownership. Third, information screening preferences are subject to the same determinants of investment performance. Investors who have more wealth and information are prone to trust their own opinions when making trading decisions, show less vulnerability to behavioural biases, and achieve higher returns. Although information screening preferences have a somewhat independent effect on investors’ mistakes and investment outcomes, this is mainly a feature of winners who are usually wealthy, well-educated and reside in financial centres. It is also interesting that managers in China who have the typical characteristics of winners tend to listen to grapevine news, which is actually negatively correlated with return performance. This may result from overconfidence in their ability to access to

insider information, which is deeply rooted in Chinese culture.

This study has many limitations. Investment return performance is the dependent variable in almost all of the regressions in studies 2 and 3. However, as this performance is self-reported, it may not be as trustworthy as that from trading records. In addition, I have only two periods of data for investment return rates. This is not enough to guarantee the consistency of the effects over time. The proxy variable for trait anxiety, PTA, is not as reliable as scores obtained from formal psychometric tests. Despite the above shortcomings, I have done my best with the given dataset, which is actually rare. I aim to obtain a higher-quality dataset for future studies.

Tables

Table 1-1. Basic characteristics¹¹

Panel A. Means and gender difference

	Total	Female	Male	Female minus Male	p-statistic
<u>Demographic characteristics</u>					
Age	49.271	48.747	49.541	-0.794	0.002
Ethnic Minority	0.032	0.030	0.033	-0.003	0.450
Married	0.920	0.830	0.966	-0.136	0.000
Family Size	2.906	2.833	2.943	-0.111	0.000
<u>Education</u>					
High School Dummy	0.347	0.372	0.334	0.039	0.000
Junior College Dummy	0.190	0.178	0.196	-0.018	0.029
University Dummy	0.139	0.100	0.159	-0.059	0.000
Financial Literacy Dummy	0.788	0.799	0.783	0.016	0.063
<u>Job</u>					
Salary Income	0.117	0.082	0.134	-0.052	0.000
Full-time employee Dummy	0.697	0.578	0.758	-0.180	0.000
Public Sector Dummy	0.352	0.267	0.396	-0.129	0.000
Entrepreneur Dummy	0.066	0.045	0.078	-0.033	0.000
Finance Sector Dummy	0.017	0.019	0.016	0.003	0.234
Manager Dummy	0.038	0.016	0.049	-0.033	0.000
Professional Dummy	0.164	0.121	0.187	-0.066	0.000
Clerk Dummy	0.218	0.223	0.216	0.007	0.437
<u>Other</u>					
Internet Access Dummy	0.545	0.579	0.528	0.051	0.000
Financial Center Dummy	0.209	0.269	0.178	0.091	0.000

¹¹ See Appendix 3 Panel A and Panel B for detailed description of the variables.

Panel B. Proportions and ratios

Characteristics of household head	(I) Population proportion in sample	(II) Conditional rate of participation
<u>Age level</u>		
Age<=35	11.52%	22.06%
35<age<=45	27.14%	21.57%
45<age<=60	43.44%	20.62%
Age>60	17.90%	11.95%
<u>Gender</u>		
Female	33.94%	21.53%
Male	66.06%	17.70%
<u>Native</u>		
Han	96.82%	20.45%
Minority	3.18%	10.85%
<u>Marital status</u>		
Married	92.10%	20.82%
Other	7.90%	12.37%
<u>Education levels</u>		
Below High school	34.42%	13.14%
High school	34.68%	22.40%
Junior College	18.99%	28.40%
University and above	13.91%	31.91%
<u>Employment status</u>		
Employed	69.63%	22.50%
Retired	25.78%	14.72%
Other	4.59%	14.84%
<u>Job (conditional on employed)</u>		
Public Sector Employee	50.58%	25.23%
Private business owner	9.54%	17.54%
Other	39.88%	20.18%
<u>Industry</u>		
Finance	1.69%	37.58%
Information	1.80%	36.63%
Other	96.50%	21.71%
<u>Category of cities</u>		
Major city	42.23%	24.82%
2th-5th city	37.46%	17.90%
Sixth city	20.30%	14.13%

Table 1-2. Attitudes and preferences¹²

Attitudes/ Preferences	(I) Population proportion in sample	(II) Conditional rate of participation
<u>Horizon(year)</u>		
Horizon<=1	42%	18.71%
1< Horizon<=3	35%	23.65%
Horizon>3	24%	20.90%
<u>Risk tolerance</u>		
High	8%	41.59%
Middle	50%	30.29%
Zero	42%	5.43%
<u>To what extent will investment outcome influence life quality</u>		
Huge	27%	10.34%
Moderate	47%	23.59%
No at all	26%	26.31%
<u>To what extent will investment outcome influence mood</u>		
Huge	31%	12.93%
Moderate	53%	26.90%
No at all	16%	15.59%
<u>Degree of optimism on future Economy (5 as the highest)</u>		
1	1.19%	12.26%
2	7.72%	19.67%
3	33.90%	19.14%
4	50.38%	20.72%
5	6.81%	22.67%
<u>Self-reported propensity to save (5 as the largest)</u>		
1	1.57%	31.91%
2	14.32%	32.65%
3	28.66%	23.47%
4	42.44%	15.60%
5	13.01%	12.24%

¹² See Appendix 3 Panel C for detailed description of the variables.

Table 2. Financial characteristics on household level

Panel A. Descriptive Statistics

	Mean	St. dev.	Skewness	Kurtosis	25th percentile	Median	95th percentile
<u>Family asset</u>							
Bank saving	88,758	3,086,621	97	9,416	10,000	30,000	200,000
Stock	15,960	62,993	10	158	0	0	100000
Fund	5,645	36,486	26	1,121	0	0	30000
bond	58	489	11	127	0	0	0
Real estate	457,311	974,753	30	1,541	120,000	300,000	1,400,000
Amount of real estate not for self-residence	0.165	0.448	5	50	0	0	1
<u>Family income</u>							
Family total Income	34,341	26,499	5	62	18,646	27,810	78,466
Family disposable income	31,009	24,073	5	82	16,953	25,180	70,955

(To be continued)

(Table 2 Panel A continued)

	Mean	St. dev.	Skewness	Kurtosis	25th percentile	Median	95th percentile
<u>Family expenditure</u>							
Total Expenditure	31,560	84,431	36	2,004	14,498	21,808	66,791
Consumption	20,919	18,739	5	53	11,134	16,422	47,201
Defendants	745	3,818	33	1,661	0	0	4,000
Loan repayment	743	5,518	29	1,397	0	0	4,454
Social security	2795	3,476	3	26	90	1840	9,204
Health care	335	1,911	23	848	0	0	1,574
Travelling	213	2,274	54	4,100	0	0	626
<u>Ratios</u>							
Consumption to total expenditure	77.60%	16%	-1	5	69%	80%	99%
Total expenditure to deposabe income of household	93.11%	119%	18	468	62%	80%	154%

Panel B. Proportions and Ratios

Financial characteristics	(I) Ratio of amount of the group to full sample	(II) Stock ownership ratio of the group
<u>Family income</u>		
Poor (income less than half of the median)	12.68%	6.49%
Top 5% richest in term of income	5.00%	41.55%
Top 1% richest in term of income	1.00%	47.52%
<u>Risk-free financial asset ownership</u>		
Bank saving ≤ 0	14.57%	14.58%
Bank saving > 0	85.43%	21.10%
<u>Illiquid asset ownership</u>		
No house property	14.69%	16.12%
House property	85.31%	20.61%
House property not for self-residence	14.62%	23.64%
<u>Background risk (Bad health condition)</u>		
Health care expenditure more than the median	24.72%	20.58%
<u>Residential house resource</u>		
Renting	13.04%	17.51%
Owning	85.31%	20.61%
Other	1.65%	17.00%

Table 3. Descriptive statistics of key variables in regressions¹³**Panel A. Variables for the first time appear in Chapter 4**

Variable	mean	sd	Quantiles					Note
			min	p25	p50	p75	max	
<u>Financial characteristics</u>								
Total Asset	0.057	0.327	0.000	0.016	0.035	0.066	30.062	Sum of bank saving, stock, fund, bond, and real estate value ¹⁴
Salary Income	0.117	0.147	0.000	0.000	0.084	0.174	2.144	Individual salary of primary job of household head
Stockholding	0.161	0.632	0	0	0	0	15	Value amount of equity held in household's portfolio
<u>Variables reflecting information cost</u>								
Financial Literacy Dummy	0.788	0.409	0	1	1	1	1	=1 if know GFC was ever happened in history
Financial Center Dummy	0.209	0.407	0	0	0	0	1	=1 if dwelling in Beijing, Shanghai, Guangzhou or Shenzhen
Internet Access Dummy	0.545	0.498	0	0	1	1	1	=1 if having computer with access to internet at home

(To be continued)

¹³ For detailed description for all variables, see Appendix 3. For variables whose names are not self-explaining, brief descriptions are list in the 'Note' column.¹⁴ See Table 2 Panel A 'Family asset' for descriptive statistics for each asset holding.

(Table 3 Panel A continued)

Variable	mean	sd	Quantiles					Note
			min	p25	p50	p75	max	
<u>Job Satisfaction</u>								
Overall	3.342	0.735	1	3	3	4	5	Overall satisfaction level on job in general
Pay	2.552	0.972	1	2	3	3	5	Specific satisfaction level on salary income
Fringe Benefits	2.707	0.975	1	2	3	3	5	Specific satisfaction level on Fringe Benefits
Hours of work	3.105	0.839	1	3	3	4	5	Specific satisfaction level on Hours of work
Job Stability	3.223	0.884	1	3	3	4	5	Specific satisfaction level on Job Stability
Job Security	3.415	0.825	1	3	3	4	5	Specific satisfaction level on Job Security
Relationship with Co-workers	3.678	0.667	1	3	4	4	5	Specific satisfaction level on Relationship with Co-workers

Panel B. Variables for the first time appear in Chapter 5

Variable	mean	sd	Quantiles					Note
			min	p25	p50	p75	max	
<u>Measures for Individual stock investment performance</u>								
HPR ₁	-2.705	28.574	-95	-20	-3	10	300	Holding period return rate in last half year
HPR ₂	-13.007	36.017	-95	-40	-20	10	500	Holding period return rate in last three year
AR ₁	2.825	71.125	-99.750	-36.000	-5.910	21.000	1500.000	Annualized return rate corresponding to HPR ₁
AR ₂	-6.247	12.804	-63.160	-15.657	-7.168	3.228	81.712	Annualized return rate corresponding to HPR ₂
Loser ₁	0.515	0.500	0	0	1	1	1	=1 if HPR ₁ <0
Loser ₂	0.656	0.475	0	0	1	1	1	=1 if HPR ₂ <0

(To be continued)

(Table 3 Panel B Continued)

Variable	mean	sd	Quantiles	Note	mean			sd	Note
			min	p25	p50	p75	max		
<u>Investor Mistakes</u>									
Under-diversification	2.831	2.014	1	2	2	3	40	Number of stocks held in portfolio	
Disposition Effect	-0.860	0.617	-2	-1	-1	0	0	=0 if never cut loss; =-1 if sometimes cut loss; =-2 if always strictly cut loss	
<u>Information Screening Preferences</u>									
Personal Experience Preference	2.805	1.123	0	2	3	4	4		
Own Analysis Preference	2.918	1.070	0	2	3	4	4		
Consultant Advice Preference	2.297	1.177	0	1	2	3	4		
Peer Opinion Preference	1.549	1.096	0	1	1	2	4		
Grapevine News Preference	0.476	0.930	0	0	0	1	4		

Panel C. Variables for the first time appear in Chapter 6

Variable	mean	sd	Quantiles					Notes
			min	p25	p50	p75	max	
<u>Global Financial Crisis related Variables</u>								
SA	3.050	0.714	1	2.75	3	3.5	5	State anxiety caused by GFC
FC_Assets	3.550	0.892	1	3	3	4	5	GFC's impact on household total asset
FC_Salary_income	3.395	0.873	1	3	3	4	5	GFC's impact on individual salary income
FC_Job_stability	3.213	0.613	1	3	3	3	5	GFC's impact on individual job stability
FC_Work_pressure	3.445	0.792	1	3	3	4	5	GFC's impact on individual work pressure
Stock Price Consideration	2.301	1.202	1	1	2	3	5	Importance of stock price for an interviewee's evaluation on GFC impacts
<u>Measures for Trait Anxiety</u>								
PTA	0.002	0.689	-2.476	-0.390	0.000	0.394	2.163	Proxy for TA derived from a quantile regression
PTA2	0.000	0.680	-2.645	-0.409	0.009	0.399	2.366	Proxy for TA derived from an OLS regression

Table 4-1. Determinants of Stock Market Participation

Panel A. Probit regression for determinants of stock market participation

Independent variables	Dependent variable: Stock-owner Dummy (=1 if one has or had ever held stocks)				
	(I) dF/dx	(II) Coef.	(III) z	(IV) p>z	(V) x-bar
<u>Constraint</u>					
Total Asset	0.1153	0.4601	3.69	0.0000	0.0584
High Vulnerability to Wealth Risk Dummy	-0.0789	-0.3411	-7.67	0.0000	0.2640
Low Vulnerability to Wealth Risk Dummy	0.0505	0.1929	4.99	0.0000	0.2550
High School Dummy	0.0462	0.1794	4.02	0.0000	0.3465
Junior College Dummy	0.0589	0.2205	4.1	0.0000	0.1922
University Dummy	0.0453	0.1708	2.8	0.0050	0.1432
Salary Income	0.0908	0.3623	2.78	0.0050	0.1202
Financial Literacy Dummy	0.0691	0.3012	6.54	0.0000	0.7948
Financial Center Dummy	0.0874	0.3216	8.34	0.0000	0.2244
Internet Access Dummy	0.0745	0.3028	8.33	0.0000	0.5629

(To be continued)

(Table 4-1 Panel A continued)

Independent variables	Dependent variable: Stock-owner Dummy (=1 if one has or had ever held stocks)				
	(I) dF/dx	(II) Coef.	(III) z	(IV) p>z	(V) x-bar
<u>Behavioral Heterogeneity</u>					
High Risk Tolerance Dummy	0.1042	0.3637	6.74	0.0000	0.0798
Low Risk Tolerance Dummy	-0.2251	-0.9719	-23.85	0.0000	0.4163
Gamble Dummy	0.0284	0.1088	2.07	0.0380	0.0976
Optimistic Expectation Dummy	0.0299	0.1141	1.76	0.0780	0.0690
Pessimistic Expectation Dummy	0.0267	0.1016	0.6	0.5490	0.0103
Propensity to Consume	0.0152	0.0607	2.62	0.0090	1.7786
<u>Other Control Variables</u>					
Age	0.0105	0.0418	3.92	0.0000	49.22
Age squared	-0.0001	-0.0004	-3.63	0.0000	2565.72
Female	0.0452	0.1756	4.68	0.0000	0.3399
Married	0.0623	0.2805	3.95	0.0000	0.9215
Ethnic Minority	-0.0711	-0.3337	-3.15	0.0020	0.0305

Note: Number of observations is 9027; Pseudo R Square is 0.2056. Some insignificant control variables and the constant term are not reported to save space.

Panel B. Robust Check

Independent variables	Dependent variable: Stock-owner Dummy (=1 if one has or had ever held stocks)		
	(I)	(II)	(III)
<u>Constraint</u>			
Total Asset	0.460 ^{***} (3.69)	0.520 ^{***} (4.34)	
High Vulnerability to Wealth Risk Dummy	-0.341 ^{***} (-7.67)	-0.462 ^{***} (-11.16)	
Low Vulnerability to Wealth Risk Dummy	0.193 ^{***} (4.99)	0.0832 ^{**} (2.31)	
Salary Income	0.362 ^{***} (2.78)	0.516 ^{***} (4.15)	
High School Dummy	0.179 ^{***} (4.02)	0.207 ^{***} (4.98)	
Junior College Dummy	0.221 ^{***} (4.10)	0.268 ^{***} (5.33)	
University Dummy	0.171 ^{***} (2.80)	0.263 ^{***} (4.57)	
Financial Literacy Dummy	0.301 ^{***} (6.54)	0.333 ^{***} (7.79)	
Financial Center Dummy	0.322 ^{***} (8.34)	0.294 ^{***} (8.14)	
Internet Access Dummy	0.303 ^{***} (8.33)	0.368 ^{***} (10.80)	
<u>Behavioral Heterogeneity</u>			
High Risk Tolerance Dummy	0.364 ^{***} (6.74)		0.349 ^{***} (6.75)
Low Risk Tolerance Dummy	-0.972 ^{***} (-23.85)		-1.021 ^{***} (-26.26)
Gamble Dummy	0.109 ^{**} (2.07)		0.113 ^{**} (2.23)
Optimistic Expectation Dummy	0.114 [*] (1.76)		0.110 [*] (1.77)
Propensity to Consume	0.0607 ^{***} (2.62)		0.0388 [*] (1.78)

(To be continued)

(Table 4-1 Panel B continued)

Independent variables	Dependent variable: Stock-owner Dummy (=1 if one has or had ever held stocks)		
	(I)	(II)	(III)
<u>Other Control Variables</u>			
Age	0.0418*** (3.92)	0.0300*** (2.98)	0.0385*** (3.84)
Age squared	-0.000389*** (-3.63)	-0.000327*** (-3.23)	-0.000371*** (-3.68)
Female	0.176*** (4.68)	0.144*** (4.05)	0.246*** (6.90)
Married	0.281*** (3.95)	0.268*** (4.04)	0.372*** (5.39)
Ethnic Minority	-0.334*** (-3.15)	-0.304*** (-3.02)	-0.386*** (-3.80)
<i>N</i>	9027	9116	9099
Pseudo R Square	0.206	0.108	0.153
<i>t</i> statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$			

Note: Some insignificant control variables and the constant term are not reported to save space.

Table 4-2 Job Satisfaction and Stock Market Participation

Panel A. Probit regression for job satisfaction effect

	Dependent variable: Stock-owner Dummy (=1 if one has or had ever held stocks)				
	(I)	(II)	(III)	(IV)	(V)
Independent variable:	dF/dx	Coef.	z-statistic	p>z	x-bar
<u>Job Satisfaction</u>					
Overall	-0.0326	-0.1050	-3.39	0.0010	3.3471
Pay	-0.0160	-0.0517	-2.55	0.0110	2.5636
Fringe Benefits	-0.0054	-0.0173	-0.82	0.4090	2.7160
Hours of work	0.0158	0.0507	2.34	0.0190	3.1112
Job Stability	0.0341	0.1096	4.55	0.0000	3.2376
Job Security	0.0166	0.0535	2.12	0.0340	3.4278
Relationship with Co-workers	0.0005	0.0016	0.06	0.9500	3.6806

Note: All the independent variables in the regression are measures of job satisfaction, as listed in the table. This regression is identical to the one reported in Panel B column (I), where the magnitude of effects, dF/dx is not reported.

Panel B. Robust Check

Independent variables	Dependent variable: Stock-owner Dummy (=1 if one has or had ever held stocks)		
	(I)	(II)	(III)
<u>Job Satisfaction</u>			
Overall	-0.105*** (-3.39)	-0.0985*** (-3.17)	-0.0552* (-1.65)
Pay	-0.0517** (-2.55)	-0.0498** (-2.45)	-0.0657*** (-2.98)
Fringe Benefits	-0.0173 (-0.82)	-0.0153 (-0.73)	-0.0390* (-1.71)
Hours of work	0.0507** (2.34)	0.0555** (2.55)	0.0437* (1.87)
Job Stability	0.110*** (4.55)	0.104*** (4.29)	0.0413 (1.58)
Job Security	0.0535** (2.12)	0.0517** (2.04)	0.0403 (1.48)
Relationship with Co-workers	0.00163 (0.06)	-0.0121 (-0.46)	-0.0178 (-0.63)
<u>Control</u>			
Age		-0.00599*** (-3.99)	0.00369** (2.15)
Female		0.196*** (5.80)	0.283*** (7.60)
Married		0.396*** (5.77)	0.409*** (5.47)
Ethnic Minority		-0.347*** (-3.45)	-0.365*** (-3.37)
High Risk Tolerance Dummy			0.327*** (5.97)
Low Risk Tolerance Dummy			-1.041*** (-24.42)
Total Asset			0.863*** (7.01)
Salary Income			1.048*** (9.05)
<i>N</i>	7707	7707	7449
<i>Pseudo R Square</i>	0.00593	0.0163	0.139

t statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: In Column I, only variables measuring job satisfaction are included as independent variable; in Column II, personal characteristics are added; Column III further includes all significant variables identified in Table 4-1 regression. Insignificant control variables and constant are not reported to save space.

Table 5-1. Determinants of Individual Stock Investment Return Performance (IP)

Panel A. OLS regression for determinants of IP

Independent variables	Dependent variable: IP	
	(I) AR ₁	(II) AR ₂
<u>Traditional variables</u>		
Total Asset	7.144 ^{***} (2.80)	0.513 (1.18)
Age	0.101 (0.34)	0.0327 (0.64)
Female	-5.797 (-1.20)	-0.194 (-0.24)
Ethnic Minority	-3.308 (-0.21)	-5.161 ^{**} (-2.04)
High School Dummy	0.455 (0.06)	1.029 (0.87)
Junior College Dummy	1.715 (0.21)	0.367 (0.28)
University Dummy	15.69 [*] (1.78)	0.299 (0.20)
Risk Tolerance	7.300 [*] (1.67)	-0.482 (-0.67)
<u>Investor mistakes</u>		
Under-diversification	0.193 (0.18)	0.469 ^{***} (2.58)
Disposition Effect	-11.65 ^{***} (-3.29)	-3.148 ^{***} (-5.36)
<u>Job Satisfaction</u>		
Overall	-1.552 (-0.38)	0.0374 (0.06)
Pay	1.405 (0.49)	0.738 (1.55)
Hours of Work	0.0849 (0.03)	0.595 (1.27)
Job Stability	-1.115 (-0.34)	0.748 (1.39)
<i>N</i>	1298	1346
adj. <i>R</i> ²	0.03	0.03
<i>t</i> statistics in parentheses * <i>p</i> < 0.1, ** <i>p</i> < 0.05, *** <i>p</i> < 0.01		

Note: The dependent variables AR₁ and AR₂, both are measures for IP. Some insignificant control variables and constant term are not reported to save space.

Panel B. Candidates for instrument variables for sample selection bias analysis

	<u>Participation</u>	<u>Investment performance</u>	
	(I)	(II)	(III)
<u>Independent variables</u>	Stock-owner	AR ₁	AR ₂
<u>Job Satisfaction</u>			
Overall	-0.0598 [*] (-1.93)	3.015 (0.98)	0.370 (0.68)
Pay	-0.0901 ^{***} (-4.40)	1.647 (0.81)	0.547 (1.53)
Hours of Work	0.0414 [*] (1.77)	-0.242 (-0.11)	0.533 (1.33)
Job Stability	0.0212 (0.86)	0.175 (0.07)	0.365 (0.86)
<u>Demographic Characteristics</u>			
Age	0.0271 ^{**} (2.36)	0.231 (0.19)	0.155 (0.72)
Age square	-0.000239 ^{**} (-2.05)	-0.000115 (-0.01)	-0.00161 (-0.73)
Female	0.190 ^{***} (4.94)	-6.510 [*] (-1.68)	-0.372 (-0.54)
Married	0.279 ^{***} (3.61)	3.861 (0.45)	-0.265 (-0.18)
Ethnic Minority	-0.340 ^{***} (-3.12)	-9.891 (-0.76)	-3.377 (-1.58)
<u>Constraints</u>			
High School Dummy	0.197 ^{***} (4.12)	2.965 (0.57)	1.714 [*] (1.85)
Junior College Dummy	0.278 ^{***} (5.03)	2.876 (0.49)	1.122 (1.09)
University Dummy	0.247 ^{***} (3.97)	14.16 ^{**} (2.20)	1.275 (1.13)
Financial Center Dummy	0.283 ^{***} (6.87)	7.275 [*] (1.85)	0.499 (0.72)
Internet Access Dummy	0.326 ^{***} (8.43)	4.957 (1.19)	-0.731 (-0.99)
Financial Literacy Dummy	0.284 ^{***} (5.86)	2.678 (0.49)	-0.168 (-0.17)
Salary Income	0.168 (1.14)	3.704 (0.31)	0.707 (0.33)
Household Total Income	0.385 ^{***} (4.77)	1.254 (0.20)	0.721 (0.60)

(To be continued)

(Table 5-1 Panel B continued)

Independent variables	<u>Participation</u>	<u>Investment performance</u>	
	(I) Stock-owner	(II) AR ₁	(III) AR ₂
Total Asset	0.444*** (3.39)	6.825*** (2.87)	0.502 (1.18)
House-owner Dummy	0.0196 (0.36)	4.666 (0.83)	0.790 (0.79)
Mortgage Dummy	-0.00888 (-0.19)	-0.800 (-0.17)	1.039 (1.27)
Finance Sector Dummy	0.244** (2.18)	7.519 (0.78)	3.346** (1.99)
<u>Preference and belief</u>			
Risk Tolerance	0.740*** (24.56)	10.81*** (3.13)	0.198 (0.33)
Cigarette Consumption	-3.773* (-1.67)	-250.2 (-1.08)	-74.75* (-1.89)
Gamble Dummy	0.107** (1.97)	2.705 (0.52)	0.0899 (0.10)
Optimism on Economy	0.0429* (1.88)	3.582 (1.56)	0.402 (0.99)
<i>N</i>	7451	1712	1772
adj. <i>R</i> ²		0.018	0.009
<i>Pseudo R Square</i>	0.164		
<i>t</i> statistics in parentheses * <i>p</i> < 0.1, ** <i>p</i> < 0.05, *** <i>p</i> < 0.01			

Note: Dependent variable in model (I) is measure of stock investment participation; in model (II) / (III) dependent variable is measure for return performance, namely annualized return rate in half year/ three years period before survey. Independent variables to the interest are the group about job satisfaction. Some insignificant control variables and constant term are not reported to save space.

Panel C. Heckman selection model

● AR_1 as measure of IP:

LR test of indep. eqns. ($\rho = 0$): $\chi^2(1) = 1.66$ Prob > $\chi^2 = 0.1972$

	Coef.	Std. Err.	z	P>z
athrho	-0.152	0.087	-1.75	0.08
lnsigma	4.268	0.020	218.46	0
rho	-0.151	0.085		
sigma	71.375	1.394		
lambda	-10.773	6.160		

● AR_2 as measure of IP:

LR test of indep. eqns. ($\rho = 0$): $\chi^2(1) = 0.02$ Prob > $\chi^2 = 0.9015$

	Coef.	Std. Err.	z	P>z
athrho	0.048	0.380	0.13	0.899
lnsigma	2.545	0.021	121.1	0
rho	0.048	0.379		
sigma	12.743	0.268		
lambda	0.615	4.840		

Note: For the regression of AR_1 , number of observation in regression is 7315, where 5603 observations are censored; for that of AR_2 , number of observation in regression is 7375, where 5603 observations are censored. Independent variables for both participation regression and IP regression are the same variables used in Table 4-1 Panel A. Instrumental variables are measures for job satisfaction level, including job satisfaction variables such as Overall, Pay, Hours of Work and Job Stability.

Table 5-2 Information Screening Preference and Investor characteristics

Panel A. Association investor characteristics to Information Screening Preference (IPS)

Independent variables	Dependent variable: IPS				
	(I) Personal Experience	(II) Own Analysis	(III) Consultant Advice	(IV) Peer Opinion	(V) Grapevine News
Age	0.00230 (0.75)	-0.00249 (-0.81)	-0.000315 (-0.11)	0.00380 (1.25)	-0.00884 ^{**} (-2.42)
Female	-0.107 ^{**} (-2.00)	-0.0173 (-0.32)	-0.0194 (-0.38)	0.112 ^{**} (2.13)	0.0900 (1.42)
Ethnic Minority	-0.203 (-1.17)	0.0714 (0.40)	-0.232 (-1.37)	0.212 (1.23)	0.387 ^{**} (2.02)
Total Asset	0.175 (0.67)	0.784 ^{***} (2.59)	-0.0110 (-0.32)	0.0306 (0.91)	0.0238 (0.70)
Salary Income	-0.0253 (-0.16)	0.164 (1.00)	-0.244 (-1.59)	0.116 (0.74)	-0.119 (-0.64)
House-owner Dummy	-0.123 (-1.57)	-0.0721 (-0.92)	0.000679 (0.01)	-0.0356 (-0.47)	0.262 ^{***} (2.67)
University Dummy	-0.0283 (-0.42)	0.0844 (1.25)	-0.0692 (-1.06)	0.125 [*] (1.88)	-0.0592 (-0.73)
Financial Literacy Dummy	0.108 (1.49)	0.212 ^{***} (2.95)	-0.0544 (-0.77)	-0.0571 (-0.79)	-0.207 ^{**} (-2.47)
Financial Center Dummy	-0.0893 (-1.61)	0.125 ^{**} (2.23)	0.000711 (0.01)	-0.00125 (-0.02)	-0.107 [*] (-1.66)

(To be continued)

(Table 5-2 Panel A continued)

Independent variables	Dependent variable: IPS				
	(I) Personal Experience	(II) Own Analysis	(III) Consultant Advice	(IV) Peer Opinion	(V) Grapevine News
Internet Access Dummy	0.0225 (0.39)	0.0850 (1.51)	-0.0480 (-0.87)	-0.0436 (-0.78)	-0.127* (-1.91)
Retired Dummy	0.0215 (0.25)	0.107 (1.24)	-0.0602 (-0.72)	-0.132 (-1.55)	0.143 (1.39)
Finance Sector Dummy	0.0460 (0.33)	0.334** (2.36)	-0.145 (-1.10)	-0.0279 (-0.21)	-0.137 (-0.81)
Manager Dummy	-0.0963 (-0.83)	-0.244** (-2.13)	0.0466 (0.41)	-0.0315 (-0.27)	0.407*** (3.06)
<i>N</i>	2001	2044	2020	1994	1987
Pseudo R Square	0.000643	0.00878	0.000667	0.00102	0.0131

t statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Dependent variables in model (I) to (V) are respectively preference on Personal Experience, Own Analysis, Consultant Advice, Peer Opinion and Grapevine News. Some insignificant control variables such as job satisfaction measures and constant term are not reported to save space.

Panel B. Association investor characteristics to confidence

Independent variables	Dependent variable
	Confidence
Financial Literacy Dummy	0.279*** (3.16)
Total Asset	0.853** (2.35)
Financial Center Dummy	0.125* (1.84)
Manager Dummy	-0.439*** (-3.14)
Finance Sector Dummy	0.572*** (2.88)
<i>N</i>	1925
Pseudo R Square	0.0180
<i>t</i> statistics in parentheses	* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Dependent variable is the dummy variable Confidence, which takes value of 1 when the investor values his or her own opinion more important than others'¹⁵, and 0 otherwise. Insignificant control variables such as job satisfaction measures and constant term are not reported to save space.

¹⁵ An investor is recognized as valuing his or her own opinion more important than others' when s/he gave either Personal Experience or Own Analysis the highest score among all the 5 IPSs, and the value of dummy variable Confidence is correspondingly valued as one.

Table 5-3 Information Screening Preference and Investor Mistakes

Panel A. Association Information Screening Preference to Investor Mistakes

Table 5-3 Panel A reports the correlation matrix for information screening preferences and investor mistakes.

Coefficients of correlation	Personal Experience	Own Analysis	Consultant Advice	Peer Opinion	Grapevine News
Under-diversification	-0.039 (0.104)	0.001 (0.976)	0.003 (0.915)	0.018 (0.460)	-0.039 (0.256)
Disposition Effect	-0.055 (0.013)	-0.060 (0.006)	0.011 (0.607)	0.101 (0.000)	-0.055 (0.731)

p statistics in parentheses

Panel B. Association investor confidences to Investor Mistakes

Table 5-3 Panel B reports subsample mean, group difference and t-test result of the group difference for propensities related with investor mistakes.

	Conditional mean		Group Difference of mean	p-statistic of the group difference
	Confidence=1	Confidence=0		
Under-diversification	-2.911	-2.735	-0.176	0.112
Disposition Effect	-0.877	-0.805	-0.072	0.019

Table 5-4 Information Screening Preference (IPs) and of Individual Stock Investment Return Performance (IP)

Panel A. Effects of specific ISPs on IP

Independent variable	Dependent variable: AR ₁			Dependent variable: AR ₂		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Personal Experience Preference	3.049 (1.52)		1.385 (0.70)	0.0646 (0.19)		-0.0953 (-0.26)
Own Analysis Preference	5.051** (2.56)		1.612 (0.83)	0.299 (0.87)		0.134 (0.38)
Peer Opinion Preference	-1.929 (-0.99)		-2.223 (-1.15)	-0.756** (-2.24)		-0.703** (-2.02)
Grapevine News Preference	-0.887 (-0.39)		-1.005 (-0.44)	-0.405 (-1.02)		-0.327 (-0.79)
Risk Tolerance		8.185** (2.46)	5.104 (1.48)		-0.644 (-1.09)	-0.923 (-1.49)
Total Asset		6.996*** (3.00)	199.8*** (10.99)		0.624 (1.48)	10.23*** (2.92)
Age		0.129 (0.72)	0.0359 (0.19)		0.00630 (0.19)	0.00639 (0.19)
Female		-5.239 (-1.44)	-5.943 (-1.57)		-0.477 (-0.73)	-0.442 (-0.64)
Ethnic Minority		-13.45 (-0.99)	-9.915 (-0.72)		-5.567** (-2.37)	-5.188** (-2.15)

(To be continued)

(Table 5-4 Panel A continued)

Independent variable	Dependent variable: AR ₁			Dependent variable: AR ₂		
	(I)	(II)	(III)	(IV)	(V)	(VI)
PTA		-9.635*** (-3.93)	-10.35*** (-4.07)		-1.553*** (-3.54)	-1.735*** (-3.73)
Family Size		-2.934 (-1.33)	-3.165 (-1.39)		-0.217 (-0.55)	-0.127 (-0.30)
High School Dummy		3.781 (0.77)	-0.288 (-0.06)		1.827** (2.08)	1.300 (1.42)
Junior College Dummy		5.008 (0.89)	-0.909 (-0.16)		1.407 (1.41)	0.956 (0.91)
University Dummy		14.35** (2.31)	5.077 (0.78)		1.526 (1.38)	0.597 (0.51)
Financial Center Dummy		9.370** (2.58)	-1.960 (-0.51)		0.701 (1.08)	-0.0592 (-0.08)
Public Sector Dummy		-2.911 (-0.77)	-0.253 (-0.06)		-1.198* (-1.77)	-1.057 (-1.48)
Finance Sector Dummy		8.032 (0.86)	4.716 (0.50)		3.243* (1.94)	3.143* (1.83)
Manager Dummy		8.167 (0.96)	-1.973 (-0.22)		3.308** (2.18)	3.151* (1.92)
Under-diversification		-0.989 (-1.19)	0.293 (0.35)		-0.576*** (-3.82)	-0.532*** (-3.39)
Disposition Effect		-12.79*** (-4.46)	-10.10*** (-3.40)		-2.942*** (-5.76)	-2.473*** (-4.57)
<i>N</i>	1679	1725	1567	1742	1774	1613
adj. <i>R</i> ²	0.007	0.036	0.100	0.004	0.037	0.039
<i>t</i> statistics in parentheses * <i>p</i> < 0.1, ** <i>p</i> < 0.05, *** <i>p</i> < 0.01						

Note: Independent variables in Column (I) and (IV) are IPSs only; in Column (II) and (V) are only determinants identified in previous section; Column (III) and (VI) combine both. Some insignificant control variables and the constant term are not reported to save space.

Panel B. Effect of confidence on IP

Independent variable	Dependent variable: AR ₁			Dependent variable: AR ₂		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Confidence	12.98*** (3.29)		7.437* (1.89)	1.290* (1.88)		0.961 (1.34)
Risk Tolerance		8.185** (2.46)	5.115 (1.49)		-0.644 (-1.09)	-0.929 (-1.50)
Total Asset		6.996*** (3.00)	200.4*** (11.05)		0.624 (1.48)	10.29*** (2.94)
Age		0.129 (0.72)	0.0365 (0.20)		0.00630 (0.19)	0.00701 (0.20)
Female		-5.239 (-1.44)	-6.359* (-1.69)		-0.477 (-0.73)	-0.499 (-0.72)
Ethnic Minority		-13.45 (-0.99)	-11.36 (-0.83)		-5.567** (-2.37)	-5.486** (-2.28)
PTA		-9.635*** (-3.93)	-10.32*** (-4.07)		-1.553*** (-3.54)	-1.719*** (-3.70)
Family Size		-2.934 (-1.33)	-3.238 (-1.43)		-0.217 (-0.55)	-0.156 (-0.37)
High School Dummy		3.781 (0.77)	0.0796 (0.02)		1.827** (2.08)	1.325 (1.45)
Junior College Dummy		5.008 (0.89)	-0.689 (-0.12)		1.407 (1.41)	0.977 (0.93)
University Dummy		14.35** (2.31)	4.723 (0.73)		1.526 (1.38)	0.511 (0.43)

(To be continued)

(Table 5-4 Panel B continued)

Independent variable	Dependent variable: AR ₁			Dependent variable: AR ₂		
	(I)	(II)	(III)	(IV)	(V)	(VI)
Financial Center Dummy		9.370** (2.58)	-2.155 (-0.56)		0.701 (1.08)	-0.0455 (-0.06)
Public Sector Dummy		-2.911 (-0.77)	-0.0978 (-0.02)		-1.198* (-1.77)	-1.024 (-1.44)
Finance Sector Dummy		8.032 (0.86)	4.364 (0.47)		3.243* (1.94)	3.131* (1.82)
Manager Dummy		8.167 (0.96)	-2.438 (-0.27)		3.308** (2.18)	3.036* (1.85)
Under-diversification		-0.989 (-1.19)	0.288 (0.34)		-0.576*** (-3.82)	-0.533*** (-3.39)
Disposition Effect		-12.79*** (-4.46)	-10.45*** (-3.54)		-2.942*** (-5.76)	-2.556*** (-4.75)
<i>N</i>	1679	1725	1567	1742	1774	1613
adj. <i>R</i> ²	0.006	0.036	0.101	0.001	0.037	0.038

t statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Independent variables in Column (I) and (IV) are IPSs only; in Column (II) and (V) are only determinants identified in previous section; Column (III) and (VI) combine both. Some insignificant control variables and the constant term are not reported to save space.

Table 6-1. Regression for deriving PTA

Independent variable	Dependent variable: SA	
	(I) Quantile Regression	(II) OLS Regression
FC_Assets	0.0373*** (6.36)	0.0646*** (6.41)
FC_Salary_income	0.0267*** (4.26)	0.0443*** (4.11)
FC_Job_stability	0.0446*** (5.82)	0.0455*** (3.46)
FC_Work_pressure	0.0297*** (5.39)	0.0440*** (4.65)
Age	0.00832*** (3.28)	0.0147*** (3.36)
Age Squared	-0.0000798*** (-3.20)	-0.000143*** (-3.34)
Debtor Dummy	-0.0204 (-1.56)	-0.0455** (-2.02)
Financial Literacy Dummy	-0.00548 (-0.52)	-0.0433** (-2.40)
Knowledge on GFC	0.0328*** (6.42)	0.0517*** (5.89)
Financial Center Dummy	-0.0733*** (-4.80)	-0.0992*** (-3.77)
2nd Class City Dummy	-0.0708*** (-5.40)	-0.117*** (-5.18)
3rd Class City Dummy	-0.0697*** (-3.64)	-0.115*** (-3.49)
4th Class City Dummy	-0.0424* (-1.79)	-0.0283 (-0.69)
5th Class City Dummy	-0.00945 (-0.41)	-0.0123 (-0.31)
6th Class City Dummy	-0.0418*** (-2.94)	-0.0592** (-2.42)
Public sector Dummy	-0.0374*** (-2.79)	-0.0533** (-2.31)
Second industry Dummy	0.120** (2.15)	0.210** (2.17)
Third industry Dummy	0.126** (2.28)	0.215** (2.25)
Policy Consideration	0.00811* (1.72)	0.0204** (2.50)
Stock Price Consideration	0.00856** (1.97)	0.0128* (1.70)
PCI Consideration	0.0112** (2.30)	0.0231*** (2.75)

(To be continued)

(Table 6-1 Continued)

Independent variable	Dependent variable: SA	
	(I) Quantile Regression	(II) OLS Regression
IR Consideration	0.0128** (2.49)	0.0247*** (2.79)
Export Consideration	-0.00899* (-1.70)	-0.00900 (-0.99)
GDP Consideration	0.0106* (1.75)	0.0200* (1.91)
Employment Consideration	0.0159*** (2.83)	0.0320*** (3.31)
Bankruptcy Consideration	0.0246*** (6.27)	0.0556*** (8.22)
<i>N</i>	9218	9218
adj. R^2		0.093
Pseudo R Square	0.0075	
<i>t</i> statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$		

Note: Dependent variable SA is a measure for state anxiety caused by GFC. Independent variables are external inducements of SA. Specification (I) uses Quantile Regression in median and Specification (II) employs OLS Regression. Some insignificant control variables and the constant term are not reported to save space.

Table 6-2. External validity check on PTA

Psychological Factors (I)	Dependent variables (II)	Excepted Sign (III)	Coefficient (IV)	t- Statistic (V)	Consistency (VI)
Mood facet of	Psychological Well-being***	Negative	-0.0989	-9.01	Yes
Neuroticism	Emotional Fluctuation***	Positive	0.0774	7.62	Yes
Vulnerability facet of Neuroticism	Own Analysis**	Negative	-0.0923	-2.72	Yes
	Consultant Advice**	Positive	0.0800	2.13	Yes
	Grapevine News*	Positive	0.0569	1.92	Yes
Depression facet of Neuroticism	Satisfaction on Life***	Negative	-0.2120	-8.15	Yes
	Overall***	Negative	-0.0574	-4.79	Yes
	Pay***	Negative	-0.0591	-3.73	Yes
	Hours of Working**	Negative	-0.0408	-2.98	Yes
	Relationship with Co-worker*	Negative	-0.0234	-2.14	Yes
	Fringe Benefit**	Negative	-0.0434	-2.74	Yes
	Job Stability***	Negative	-0.0729	-5.12	Yes
	Security***	Negative	-0.0444	-3.30	Yes
	Optimism on Economy***	Negative	-0.0805	-6.88	Yes
Optimism	Optimism on Society***	Negative	-0.0444	-3.91	Yes

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: Table 6-2 reports summary data from 15 regressions. In every regression, independent variable to the interest is PTA. The fifteen dependent variables (described in Appendix 4) are listed in column (II), which reflect or are associated with corresponding psychological factors listed in Column (I). The signs of PTA's effects on each column (II) variables predicted by Psychology theory are shown in Column (III). And the main results of each regression, i.e. the coefficients and t-statistics values of PTA are listed in Column (IV) and (V) respectively. Finally, blanks in Column (VI) are filled with 'Yes' if the sign of estimated PTA coefficients in Column (IV) is consistent with the sign predicted in Column (III), and 'No' if otherwise. In these regressions I have controlled basic demographic and financial characteristics such as Age, Marital Status, Education Level, Total Asset and Salary Income. For Optimism/Pessimism, more variables are additional controlled, which actually does not bring material difference to the results.

Table 6-3. Endogeneity Check on PTA

Independent variables	Dependent variable PTA
Stock-owner Dummy	0.0211 (1.21)
Age	0.0102** (2.45)
Age Squared	-0.000116*** (-2.89)
Female	0.0149 (0.98)
Ethnic Minority	0.0145 (0.35)
_cons	-0.214** (-2.04)
<i>N</i>	9218
adj. <i>R</i> ²	0.002
<i>t</i> statistics in parentheses * <i>p</i> < 0.1, ** <i>p</i> < 0.05, *** <i>p</i> < 0.01	

Table 6-4. Distinguish trait anxiety from risk aversion

Independent variable	Dependent variable		
	(I) Risk Aversion	(II) Risk Aversion	(III) PTA
PTA	0.00461 (0.26)	0.00990 (0.55)	
Age		0.00928 (1.24)	0.00982** (2.27)
Age Squared		0.00000674 (0.09)	-0.000115*** (-2.74)
Female		0.0383 (1.38)	0.0112 (0.69)
Married		-0.0128 (-0.26)	-0.00860 (-0.30)
Family Size		-0.0331** (-2.21)	0.0126 (1.44)
Total Asset		-0.0421 (-1.19)	0.00252 (0.12)
Salary Income		-0.377*** (-3.87)	-0.0586 (-1.01)
High School Dummy		-0.127*** (-4.03)	0.0118 (0.65)
Junior College Dummy		-0.164*** (-4.26)	0.0281 (1.25)
University Dummy		-0.278*** (-6.29)	-0.0294 (-1.13)
Internet Access Dummy		-0.231*** (-8.70)	0.00302 (0.19)
<i>N</i>	8907	8907	9218
adj. R^2			0.002
Pseudo R Square	0.000	0.0290	

t statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: In column I and (II), dependent variables are both Risk Aversion and independent variables to the interest are both PTA, which is not controlled in model (II) but controlled with traditional variables measuring demographic characteristics, wealth and knowledge. Column (III) reports a regression of PTA on a host of variables same as the control variables in model (II).

Table 6-5. Effect of trait anxiety on individual stock investment return performance

Panel A. Trait Anxiety measured by PTA

Independent variable	Dependent variable: Measure for IP			
	(I) AR ₁	(II) AR ₂	(III) Loser ₁	(IV) Loser ₂
PTA	-9.899*** (-4.30)	-1.364*** (-3.27)	0.119*** (2.81)	0.121*** (2.85)
Age	0.0191 (0.09)	0.0131 (0.35)	-0.0065* (-1.70)	-0.0053 (-1.37)
Female	-6.260* (-1.73)	-0.587 (-0.89)	0.112* (1.69)	0.0717 (1.07)
Married	7.058 (0.93)	0.152 (0.11)	-0.106 (-0.77)	0.0461 (0.33)
Ethnic Minority	-11.54 (-0.95)	-3.437* (-1.66)	0.107 (0.48)	0.154 (0.71)
Retired Dummy	3.281 (0.57)	-0.289 (-0.27)	-0.0584 (-0.56)	0.152 (1.41)
Family Size	-2.512 (-1.16)	-0.067 (-0.17)	-0.000 (-0.01)	0.022 (0.55)
Stock Portfolio Size	6.430*** (4.62)	0.651** (2.54)	-0.069*** (-2.66)	-0.048* (-1.79)
Total Asset	6.421*** (2.80)	0.510 (1.20)	-0.089 (-0.54)	-0.278 (-0.80)
Household Total Income	-1.522 (-0.26)	0.564 (0.49)	-0.091 (-0.82)	-0.197* (-1.69)
High School Dummy	2.780 (0.59)	1.917** (2.26)	-0.116 (-1.36)	-0.190** (-2.19)
Junior College Dummy	4.353 (0.83)	1.285 (1.36)	-0.0601 (-0.62)	0.0225 (0.23)
University Dummy	11.15* (1.92)	1.402 (1.34)	-0.067 (-0.63)	-0.163 (-1.52)
Financial Center Dummy	5.721 (1.60)	0.285 (0.44)	-0.148** (-2.25)	0.029 (0.44)
Salary Income	4.320 (0.37)	0.845 (0.39)	-0.102 (-0.48)	0.177 (0.81)
Finance Sector Dummy	5.204 (0.57)	3.111* (1.88)	-0.065 (-0.39)	-0.179 (-1.08)
Risk Tolerance	8.703*** (2.78)	-0.413 (-0.74)	-0.156*** (-2.72)	0.007 (0.12)
Gamble Dummy	4.359 (0.89)	0.181 (0.20)	-0.034 (-0.38)	0.019 (0.21)
<i>N</i>	1884	1954	1884	1954
adj. <i>R</i> ²	0.036	0.010		
Pseudo R Square			0.0214	0.0157
<i>t</i> statistics in parentheses * <i>p</i> < 0.1, ** <i>p</i> < 0.05, *** <i>p</i> < 0.01				

Panel B. Trait Anxiety measured by PTA-group Dummies

Independent variable	Dependent variable: Measure for IP			
	(I) AR ₁	(II) AR ₂	(III) Loser ₁	(IV) Loser ₂
HTA	-9.224** (-2.17)	-1.532** (-2.00)	0.0977 (1.25)	0.0754 (0.95)
LTA	10.76** (2.39)	2.913*** (3.59)	-0.140* (-1.70)	-0.278*** (-3.41)
Age	0.0301 (0.14)	0.0156 (0.41)	-0.00666* (-1.73)	-0.00546 (-1.41)
Female	-6.400* (-1.76)	-0.565 (-0.86)	0.114* (1.71)	0.0714 (1.06)
Married	7.269 (0.96)	0.257 (0.19)	-0.110 (-0.79)	0.0378 (0.27)
Ethnic Minority	-11.64 (-0.96)	-3.540* (-1.71)	0.108 (0.49)	0.165 (0.76)
Retired Dummy	2.974 (0.52)	-0.423 (-0.40)	-0.0548 (-0.52)	0.160 (1.49)
Family Size	-2.427 (-1.12)	-0.0660 (-0.17)	-0.00137 (-0.03)	0.0213 (0.52)
Stock Portfolio Size	6.344*** (4.55)	0.653** (2.56)	-0.0674*** (-2.59)	-0.0469* (-1.76)
Total Asset	6.451*** (2.80)	0.524 (1.24)	-0.0944 (-0.50)	-0.308 (-0.88)
Household Total Income	-2.165 (-0.36)	0.393 (0.34)	-0.0826 (-0.75)	-0.181 (-1.55)
High School Dummy	2.174 (0.46)	1.784** (2.11)	-0.109 (-1.27)	-0.180** (-2.07)
Junior College Dummy	3.898 (0.74)	1.254 (1.33)	-0.0545 (-0.57)	0.0254 (0.26)
University Dummy	10.95* (1.88)	1.267 (1.21)	-0.0641 (-0.60)	-0.151 (-1.40)
Financial Center Dummy	5.812 (1.62)	0.359 (0.56)	-0.149** (-2.26)	0.0226 (0.34)
Salary Income	4.783 (0.41)	0.877 (0.41)	-0.108 (-0.50)	0.172 (0.79)
Finance Sector Dummy	5.597 (0.61)	3.069* (1.85)	-0.0693 (-0.41)	-0.174 (-1.04)
Risk Tolerance	8.613*** (2.74)	-0.465 (-0.83)	-0.155*** (-2.70)	0.0104 (0.18)
Gamble Dummy	4.560 (0.93)	0.177 (0.20)	-0.0366 (-0.41)	0.0173 (0.19)
<i>N</i>	1884	1954	1884	1954
adj. <i>R</i> ²	0.033	0.015		
<i>Pseudo R Square</i>			0.0204	0.0182
<i>t</i> statistics in parentheses * <i>p</i> < 0.1, ** <i>p</i> < 0.05, *** <i>p</i> < 0.01				

Table 6-6. Robust Check**Panel A. Regressions with Subsample**

Independent variable	Dependent variable: Measure for IP			
	(I) AR ₁	(II) AR ₂	(III) Loser ₁	(IV) Loser ₂
PTA	-6.037** (-2.42)	-1.522*** (-2.91)	0.129** (2.36)	0.139** (2.56)
Age	-0.0813 (-0.38)	0.0207 (0.46)	-0.00576 (-1.22)	-0.00702 (-1.50)
Female	-5.785 (-1.53)	-1.560** (-1.97)	0.101 (1.22)	0.136* (1.65)
Married	6.200 (0.78)	-0.810 (-0.48)	-0.146 (-0.84)	0.0845 (0.48)
Ethnic Minority	-23.80* (-1.90)	-1.940 (-0.79)	0.427 (1.52)	0.0188 (0.07)
Retired Dummy	3.294 (0.58)	-1.292 (-1.06)	-0.0170 (-0.14)	0.232* (1.84)
Family Size	-2.304 (-1.02)	-0.681 (-1.43)	0.0198 (0.40)	0.0554 (1.11)
Stock Portfolio Size	4.471*** (2.59)	1.211*** (3.32)	-0.0603 (-1.63)	-0.0890** (-2.35)
Total Asset	3.609* (1.86)	0.363 (0.87)	-0.0570 (-0.71)	-0.0777 (-0.82)
Household Total Income	7.733 (1.15)	2.072 (1.31)	-0.248 (-1.58)	-0.305* (-1.86)
High School Dummy	2.107 (0.45)	1.614 (1.63)	-0.172* (-1.67)	-0.181* (-1.75)
Junior College Dummy	3.878 (0.72)	1.292 (1.14)	-0.133 (-1.13)	-0.00749 (-0.06)
University Dummy	3.282 (0.54)	0.613 (0.48)	-0.0366 (-0.28)	-0.146 (-1.11)
Financial Center Dummy	3.868 (1.05)	0.568 (0.74)	-0.203** (-2.52)	0.0181 (0.23)
Salary Income	-3.764 (-0.31)	-2.486 (-0.94)	0.171 (0.63)	0.478* (1.71)
Finance Sector Dummy	10.16 (0.99)	2.695 (1.26)	-0.259 (-1.15)	0.000748 (0.00)
Risk Tolerance	7.530** (2.25)	-0.494 (-0.71)	-0.129* (-1.76)	-0.0193 (-0.27)
Gamble Dummy	6.724 (1.31)	0.697 (0.64)	-0.0374 (-0.33)	-0.0305 (-0.27)
<i>N</i>	1243	1307	1243	1307
adj. <i>R</i> ²	0.021	0.016		
Pseudo R Square			0.0250	0.0198

t statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel B. Regressions with Trait Anxiety Proxy Generated from OLS Model

Independent variable	Dependent variable			
	(I) AR ₁	(II) AR ₂	(III) Loser ₁	(IV) Loser ₂
PTA2	-8.468*** (-3.63)	-1.205*** (-2.86)	0.102** (2.38)	0.110** (2.55)
Age	0.0173 (0.08)	0.0129 (0.34)	-0.00651* (-1.70)	-0.00526 (-1.36)
Female	-6.364* (-1.76)	-0.600 (-0.91)	0.113* (1.71)	0.0729 (1.08)
Married	7.015 (0.92)	0.161 (0.12)	-0.106 (-0.76)	0.0448 (0.32)
Ethnic Minority	-11.36 (-0.93)	-3.412* (-1.65)	0.105 (0.47)	0.151 (0.70)
Retired Dummy	3.987 (0.69)	-0.188 (-0.18)	-0.0669 (-0.64)	0.143 (1.33)
Family Size	-2.548 (-1.17)	-0.0711 (-0.18)	0.000172 (0.00)	0.0227 (0.56)
Stock Portfolio Size	6.373*** (4.57)	0.644** (2.51)	-0.0682*** (-2.63)	-0.0470* (-1.77)
Total Asset	6.456*** (2.81)	0.514 (1.21)	-0.0895 (-0.54)	-0.280 (-0.80)
Household Total Income	-1.399 (-0.23)	0.583 (0.50)	-0.0925 (-0.84)	-0.198* (-1.70)
High School Dummy	2.783 (0.59)	1.915** (2.26)	-0.116 (-1.36)	-0.190** (-2.19)
Junior College Dummy	4.342 (0.83)	1.287 (1.36)	-0.0598 (-0.62)	0.0220 (0.22)
University Dummy	11.46** (1.98)	1.442 (1.37)	-0.0702 (-0.66)	-0.166 (-1.55)
Financial Center Dummy	5.590 (1.56)	0.273 (0.42)	-0.146** (-2.23)	0.0306 (0.46)
Salary Income	4.864 (0.42)	0.916 (0.42)	-0.109 (-0.51)	0.170 (0.78)
Finance Sector Dummy	5.518 (0.60)	3.161* (1.90)	-0.0688 (-0.41)	-0.184 (-1.11)
Risk Tolerance	8.743*** (2.79)	-0.408 (-0.73)	-0.157*** (-2.73)	0.00657 (0.11)
Gamble Dummy	4.423 (0.90)	0.190 (0.21)	-0.0347 (-0.39)	0.0184 (0.20)
<i>N</i>	1884	1954	1884	1954
adj. <i>R</i> ²	0.034	0.009		
Pseudo R Square			0.0205	0.0151
<i>t</i> statistics in parentheses * <i>p</i> < 0.1, ** <i>p</i> < 0.05, *** <i>p</i> < 0.01				

Figures

Figure 1. Model of prospect theory

Note: According to Kahneman and Tversky (1979), the value function is ‘(i) defined on deviation from the reference point; (ii) generally concave for gains and commonly convex for losses; (iii) steeper for losses than for gains.’ In Figure 1, a value function which satisfies these properties is displayed.

Figure 2. Stock Market Index in China during the Global Financial Crisis

Panel A. SSE Composite A Share (SHA: 000001)

Panel B. SHE Composite A Share (SHE: 399106)

Figure 3. Paper Return Rate of Stock Investment in the Period I (from April to September 2009)

Panel A. Holding Period Return in Sample Period I

Panel B. Annualized Return in Sample Period I

Figure 4. Paper Return Rate of Stock Investment in the Period II (from October 2006 to September 2009)

Panel A. Holding Period Return in Sample Period II

Panel B. Annualized Return in Sample Period II

Figure 5. Outline of Sarason's Model

Figure 6. A Simplified Version of State-Trait Model of Anxiety

Figure 7. State anxiety caused by GFC (SA)

Figure 8. Measures of trait anxiety

Panel A. Distribution of PTA

Panel B. Distribution of PTA2

Appendix 1. List of acronyms

Acronym	Full variable name or meaning
<i>GFC</i>	Global financial crisis beginning at 2008
<i>TA</i>	Trait anxiety
<i>IP</i>	Individual stock investment return performance
<i>SA</i>	State anxiety specific on GFC
<i>PTA</i>	A proxy for TA derived from a quantile model
<i>PTA2</i>	A proxy for TA derived from an OLS model
<i>HTA</i>	High Trait Anxiety
<i>MTA</i>	Middle Trait Anxiety
<i>CUHS</i>	China Urban Household Survey
<i>CFS</i>	China Household Finance Service Demand Survey

Appendix 2. Questionnaire

Here lists questions from China Household Finance Service Demand Survey (CFS), which are resource of corresponding variables in empirical regressions.

1. How important are the following factors when you make your investment decision? (5=very important; 4=important; 3=neutral; 2=not important; 1=not very important)

Factors	real estates	shares	mutual funds	insurance	bond
Personal experience					
Consultant advice					
Own analysis					
Peer opinion					
Grapevine news					

2. What are your views on investment risk? _____
(1) I do not mind high risk as long as there is high return; (2) I do not like high risk in investment; (3) I only make risk-free investment
3. Do you execute the ‘ cut-loss’ strategy when trading shares, i.e. sell the share when its price dropped under certain level and the market prospects on this share is not good?
(1) Execute it strictly _____; (2) Execute it occasionally _____; (3) Never do that _____
4. What is the return on your investment in stock market in the past 3 years:
gain_____ % or lose _____ %
5. What is the return on your investment in stock market in the past six months:
gain _____ % or lose _____ %
6. How do investment results affect your mood_____ (1) a lot (2) a little (3) no impact
7. How do investment results affect your daily life_____ (1) a lot (2) a little (3) no impact
8. How do you rate the importance of the following factors when you assess the impacts of the recent global financial crisis?

	1=not important at all,..., 5=very important				
1. The government stimulus package	1	2	3	4	5
2. Stock price	1	2	3	4	5
3. Consumer price indexes	1	2	3	4	5
4. Bank interest rate	1	2	3	4	5
5. Decline in export	1	2	3	4	5
6. GDP growth rate	1	2	3	4	5
7. Employment rate	1	2	3	4	5
8. Company closing down/bankrupt	1	2	3	4	5
9. Lay off workers	1	2	3	4	5

9. How do you agree/disagree with the following statements on financial crisis?

	1=strongly disagree ,..., 5=strongly agree				
1. You feel uneasy about it.	1	2	3	4	5
2. You feel nervous about it.	1	2	3	4	5
3. You worry about it.	1	2	3	4	5
4. You fear about it.	1	2	3	4	5
5. You know nothing about its underlying causes.	1	2	3	4	5
6. You know a little about its impacts.	1	2	3	4	5
7. You feel optimistic about the future economy.	1	2	3	4	5
8. You feel positive about future social development.	1	2	3	4	5

10. Has the global financial crisis made any changes to the following aspects of your life?

1=decreased a lot; 2=somewhat decreased; 3=no change; 4=somewhat increased; 5=increased a lot;

	1	2	3	4	5
1. your assets	1	2	3	4	5
2. your real income	1	2	3	4	5
3. your job security	1	2	3	4	5
4. work pressure experienced	1	2	3	4	5
5. your health	1	2	3	4	5
6. your emotional stability	1	2	3	4	5

11. To what extent do you feel satisfied with your life?

1=very unsatisfied; ...5=neutral; ... 10= very satisfied;

12. To what extent do you feel satisfied with your work?

1=very unsatisfied; ...2=neutral; ... 5= very satisfied;

(1) Pay; (2) Hours of work; (3) Interpersonal Relationship with coworker; (4) Interpersonal Relationship with superior and subordinate; (5) Work environment; (6) Fringe benefit; (7) Job stability; (8) Job security; (9) Job overall

Appendix 3. Description of Variables

Here lists variables that are involved in empirical regressions with their name, description, type (with brief description on value range, if necessary), as well as resource or calculation method for evaluation.

Panel A: Key social-economic characteristics

I. Basic Demographic characteristics

Variable Name	Description	Type	Resource/ Evaluation
<i>Age</i>	Age of respondent at September 2009	Discrete	CUHS
<i>Age Squared</i>	Age squared	Discrete	Squared value of age
<i>Female</i>	An indicator for gender	Dummy	0=Male, 1 for female
<i>Ethnic Minority</i>	An indicator for ethnic minority	Dummy	0=Han nationality, 1 for otherwise
<i>Married</i>	Marital status of the respondent.	Dummy	1=the respondent is Married, and 0 otherwise
<i>Family Size</i>	Family size	Discrete	Number of family members in the household
<i>Retired Dummy</i>	Retirement status of respondent	Dummy	1=the respondent is Retired Dummy, 0 otherwise

II. Education and financial knowledge

Variable Name	Description	Type	Resource/ Evaluation
<i>Education Years</i>	Years of schooling attained	Discrete variable with 8 unique values	CUHS
<i>High School Dummy</i>	An indicator for whether the respondent's highest education attainment is high school or equivalent	Dummy	1= high school education level, 0 for otherwise
<i>Junior College Dummy</i>	An indicator for whether the respondent's highest education attainment is Junior College or equivalent	Dummy	1= junior college education level, 0 for otherwise
<i>University Dummy</i>	An indicator for whether the respondent's highest education attainment is University or above	Dummy	1= university or above education level, 0 for otherwise
<i>Financial Literacy Dummy</i>	An indicator for whether the respondent know that Financial Crisis was ever happened in history	Dummy	1=the respondent do know the basic knowledge, zero otherwise

III. Financial status

Variable Name	Description	Type	Resource/ Evaluation
<i>Stock Portfolio Size</i>	The value of the respondent's stock holding at time of the survey	Continuous	CFS
<i>Total Asset</i>	Sum of holding value of bank saving, stock, bond insurance and real estate at time of the survey	Continuous	CFS
<i>Salary Income</i>	Personal annual labor income in 100,000 RMB Yuan in 2008.	Continuous	CUHS
<i>Household Total Income</i>	Family annual total income in 100,000 RMB Yuan in 2008.	Continuous	CUHS
<i>Stock-owner Dummy</i>	An indicator for whether an household own public equity	Dummy	1=stockowner, 0 for otherwise

<i>House-owner Dummy</i>	An indicator for whether a household own real estate	Dummy	1=house owner, 0 for otherwise
<i>Mortgage Dummy</i>	An indicator for whether a household have mortgage loan	Dummy	1=mortgage debtor, 0 for otherwise
<i>Debtor Dummy</i>	An indicator for whether a household have debt other than mortgage	Dummy	1= debtor, 0 for otherwise

IV. Other important control variables revealing information cost

Variable Name	Description	Type	Evaluation
<i>Finance Sector Dummy</i>	A indicator whether an respondent work in Finance sector	Dummy	1=respondent working in Finance sector, 0 for otherwise
<i>Financial Center Dummy</i>	An indicator whether a respondent lives near a financial center.	Dummy	1=the dwelling city is Beijing, Shanghai, Guangzhou and Shenzhen, 0 for otherwise
<i>Internet Access Dummy</i>	An indicator whether a respondent have internet access at home at time of the survey	Dummy	1= have internet access at home, 0 for otherwise
<i>High Vulnerability to Wealth Risk Dummy</i>	An indicator whether respondent's life quality is highly vulnerable to his/her investment outcome	Dummy	1= highly vulnerable, 0 for otherwise
<i>Mid Vulnerability to Wealth Risk Dummy</i>	An indicator whether respondent's life quality is moderately vulnerable to his/her investment outcome	Dummy	1= moderately vulnerable, 0 for otherwise
<i>Low Vulnerability to Wealth Risk Dummy</i>	An indicator whether respondent's life quality is not vulnerable to his/her investment outcome	Dummy	1= not vulnerable, 0 for otherwise

Panel B: Dwelling and work status

I. Dwelling City Class

Variable Name	Description	Type	Resource
<i>1st Class City Dummy</i>	An indicator for whether the respondent dwelling in any one of the major cities.	Dummy	CUHS ¹⁶
<i>2nd Class City Dummy</i>	An indicator for whether the respondent dwelling in any one of the second class cities.	Dummy	CUHS ¹⁷
<i>3rd Class City Dummy</i>	An indicator for whether the respondent dwelling in any one of the third class cities.	Dummy	CUHS ¹⁸
<i>4th Class City Dummy</i>	An indicator for whether the respondent dwelling in any one of the fourth class cities.	Dummy	CUHS ¹⁹
<i>5th Class City Dummy</i>	An indicator for whether the respondent dwelling in any one of the fifth class cities.	Dummy	CUHS ²⁰
<i>6th Class City Dummy</i>	An indicator for whether the respondent dwelling in any one of the sixth class cities.	Dummy	CUHS ²¹

¹⁶ Major cities (18): municipalities directly under the Central Government, special administration region, cities with GDP higher than RMB 160 billion and population larger than 2 millions, including Beijing, Tianjin, Chongqing, Hong Kong, Macau, Shenyang, Shanghai, Wuhan, Shenzhen, etc.

¹⁷ Second class cities (25): other cities of vice-province level, special economic zones, capitals of provinces, including Shijiazhuang, Changchun, Zhengzhou, Suzhou, Wuxi, Changsha, Lanzhou, etc.

¹⁸ Third class cities (24): 14 open coastal cities, high income cities, including Tangshan, Yantai, Xuzhou, Zhenjiang, Wenzhou, Dongguan, Beihai, Guilin, etc.

¹⁹ Fourth class cities (18): other cities with population larger than 1 million, cities with important economic status, including Handan, Anshan, Daqing, Yangzhou, Chaozhou, Liuzhou, etc.

²⁰ Fifth class cities (23): other famous cities, important transportation junctions, cities with population larger than half million, important travel cities, including Chengde, Baoding, Kaifeng, Huangshan, Jiujiang, Yan-an, etc.

²¹ Sixth class cities: all other cities.

II. Dwelling Broad Regions

Variable Name	Description	Type	Resource
<i>Beijing Dummy</i>	An indicator for whether the respondent dwelling in Beijing.	Dummy	CUHS ²²
<i>Coastal Region Dweller Dummy</i>	An indicator for whether the respondent dwelling in the coastal region.	Dummy	CUHS ²³
<i>Central Region Dweller Dummy</i>	An indicator for whether the respondent dwelling in the central region.	Dummy	CHUS ²⁴
<i>Northeast Region Dweller Dummy</i>	An indicator for whether the respondent dwelling in the northeast region.	Dummy	CHUS ²⁵
<i>West Region Dweller Dummy</i>	An indicator for whether the respondent dwelling in the west region.	Dummy	CHUS

III. Employment status

Variable Name	Description	Type	Resource
<i>Public Sector Dummy</i>	An indicator for whether the respondent work in state-own unit	Dummy	CHUS
<i>Joint-owned Dummy</i>	An indicator for whether the respondent work in joint-own unit	Dummy	CHUS
<i>Entrepreneur Dummy</i>	An indicator for whether the respondent is private-own unit	Dummy	CHUS

22 Beijing is divided as a separate province, and serves as reference group for provinces district dummies.

23 Coastal Region Dweller provinces include Tianjin, Shanghai, Jiangsu, Zhejiang, Fujian, and Guangdong.

24 Central provinces include Anhui, Hubei, and Hunan.

25 Northeast provinces include Jilin and Heilongjiang.

IV. Work Industry/ Sector

Variable Name	Description	Type	Evaluation
<i>Full-time employee Dummy</i>	An indicator for whether the respondent is working labor	Dummy	1=full-time employee, 0 for unemployed or nonlabor
<i>First Industry Dummy</i>	An indicator for whether the respondent is employed in the first industry	Dummy	1=Agriculture, Forestry, Animal husbandry and Fisheries, 0 for otherwise
<i>Second industry Dummy</i>	An indicator for whether the respondent is employed in the second industry	Dummy	1=Mining, Manufacturing, Production, Supply of electricity, gas and water, and Construction, 0 for otherwise
<i>Third industry Dummy</i>	An indicator for whether the respondent is employed in the third industry	Dummy	1=All the other industries, 0 for otherwise
<i>Finance Sector Dummy</i>	An indicator for whether the respondent is employed in the first industry	Dummy	1=Finance sector, 0 for otherwise

V. Job Position/ Occupation

Variable Name	Description	Type	Resource
<i>Manager Dummy</i>	An indicator for whether the respondent is working in a manager position	Dummy	CHUS
<i>Professional Dummy</i>	An indicator for whether the respondent is working in a professional position	Dummy	CHUS
<i>Clerk Dummy</i>	An indicator for whether the respondent is working in a clerk position	Dummy	CHUS
<i>Service occupation Dummy</i>	An indicator for whether the respondent's occupation is service-class worker	Dummy	CHUS
<i>Farmer occupation Dummy</i>	An indicator for whether the respondent's occupation is farmer	Dummy	CHUS
<i>Operator occupation Dummy</i>	An indicator for whether the respondent's occupation is operator	Dummy	CHUS
<i>Armyman occupation Dummy</i>	An indicator for whether the respondent's occupation is armyman	Dummy	CHUS

Panel C: Preference, Attitudes, Belief and Behavioral Bias

Variable Name	Description	Type	Resource/ Calculation
I. Proxy for Preferences and attitudes			
<i>Risk Tolerance</i>	Self-reported propensity of choose in risk-return pairs	Discrete with 3 unique values	Appendix1 Q2
<i>High Risk Tolerance Dummy</i>	An indicator whether risk tolerance is high	Discrete with 3 unique values	Risk Tolerance=2
<i>Mid Risk Tolerance Dummy</i>	An indicator whether risk tolerance is moderate	Discrete with 3 unique values	Risk Tolerance=1
<i>Low Risk Tolerance Dummy</i>	An indicator whether risk tolerance is low	Discrete with 3 unique values	Risk Tolerance=0
<i>Gamble Dummy</i>	An indicator whether the respondent ever buy lottery	Dummy	1=ever buy lottery, 0 for otherwise
<i>Propensity to Consume</i>	Self-reported propensity to Consume	Discrete with 5 unique values	CFS
II. Proxy for investment behavior (biases/ mistakes)			
<i>Stock-owner Dummy</i>	An indicator whether the respondent invest equity	Dummy	1=present stockholding value is positive or report HPR ₁ or HPR ₂ , 0 for otherwise
<i>Under-diversification</i>	The extent to which the stock portfolio of the respondent is under-diversified.	Discrete	Product of the number of stocks in the respondent's equity portfolio and (-1).
<i>Disposition Effect</i>	Respondent's propensity to hold losers even when the prospect of stock price is not good	Discrete with 3 unique values	Appendix1 Q3
III. Investors' evaluation on the importance of information resource			
<i>Personal Experience Preference</i>	Importance of personal past investment experience for investment decision making	Discrete with 5 unique values	Appendix1 Q1
<i>Own Analysis Preference</i>	Importance of own analysis by self for investment decision making	Discrete with 5 unique values	Appendix1 Q1
<i>Consultant Advice Preference</i>	Importance of consultants' opinion for investment decision making	Discrete with 5 unique values	Appendix1 Q1
<i>Peer Opinion Preference</i>	Importance of family's and friends' opinion for investment decision making	Discrete with 5 unique values	Appendix1 Q1

<i>Grapevine News Preference</i>	Importance of grapevine news for investment decision making	Discrete with 5 unique values	Appendix1 Q1
<i>Confidence</i>	An indicator whether a respondent prefer to listen to himself/ herself	Dummy	1= the highest score among all the 5 types of information resource is either Personal Experience or Own Analysis; 0 for otherwise

IV. Satisfaction

<i>Satisfaction on Life</i>	Satisfaction level on life overall	Discrete with 10 unique values	Appendix1 Q11
<i>Overall</i>	Satisfaction level on job overall	Discrete with 5 unique values	Appendix1 Q12-9
<i>Pay</i>	Satisfaction level on pay of current job	Discrete with 5 unique values	Appendix1 Q12-1
<i>Hours of work</i>	Satisfaction level on hours of work	Discrete with 5 unique values	Appendix1 Q12-2
<i>Relationship with Co-workers</i>	Satisfaction level on interpersonal relationship between co-workers	Discrete with 5 unique values	Appendix1 Q12-4
<i>Fringe Benefits</i>	Satisfaction level on job fringe benefit	Discrete with 5 unique values	Appendix1 Q12-6
<i>Job Stability</i>	Satisfaction level on Job Stability	Discrete with 5 unique values	Appendix1 Q12-7
<i>Job Security</i>	Satisfaction level on Job Security	Discrete with 5 unique values	Appendix1 Q12-8

V. Belief

<i>Optimism on Economy</i>	The extent the respondent feel optimistic about the future economy	Discrete with 5 unique values	Appendix1 Q9-7
<i>Optimistic Expectation Dummy</i>	An indicator whether the respondent feel very optimistic about the future economy	Dummy	<i>Optimism on Economy take the highest value</i>
<i>Pessimistic Expectation Dummy</i>	An indicator whether the respondent feel very pessimistic about the future economy	Dummy	<i>Optimism on Economy take the lowest value</i>

Optimism on Society

The extent the respondent feel positive about future social development

Discrete with 5 unique values

Appendix1 Q9-8

Panel D: Measures for individual stock investment return performance (IP)

Variable Name	Description	Type	Resource/ Evaluation
HPR_1	Holding Period return rate during the 6 months period from April to September in 2009	Percent, [-95,300]	Self-reported paper return rate. Those lower than -100 are dropped.
HPR_2	Holding Period return rate during the 36 months period from October 2006 to September 2009	Percent, [-95,500]	Self-reported paper return rate, not realized. Those lower than -100 are dropped.
AR_1	Annualized return rate during the 6 months period from April to September in 2009	Percent, [-99.75, 1500]	Annualized based on HPR_1
AR_2	Annualized return rate during the 36 months period from October 2006 to September 2009	Percent, [-63.16, 81.71]	Annualized based on HPR_2
$Loser_1$	A indicator whether an investor lost money in the 6 months period from April to September in 2009	Dummy	$Loser_1=1$ if $HPR_1<0$, zero otherwise
$Loser_2$	A indicator whether an investor lost money in the 36 months period from October 2006 to September 2009	Dummy	$Loser_2=1$ if $HPR_2<0$, zero otherwise

Panel E. Variables related to Global Financial Crisis

I. Impacts resulted from Global Financial Crisis

Variable	Description	Type	Resource
<i>FC_Assets</i>	To what extent GFC made changes to respondent's assets	Discrete variable with 5 unique values	Appendix 1 Q10-1
<i>FC_Salary_income</i>	To what extent GFC made changes to respondent's real income	Discrete variable with 5 unique values	Appendix 1 Q10-2
<i>FC_Job_stability</i>	To what extent GFC made changes to respondent's job security	Discrete variable with 5 unique values	Appendix 1 Q10-3
<i>FC_Work_pressure</i>	To what extent GFC made changes to respondent's work pressure experience	Discrete variable with 5 unique values	Appendix 1 Q10-4

II. Importance rating on considerations when respondent assesses impacts of the Globe Finance Crisis

Variable	Description	Type	Resource
<i>Policy Consideration</i>	Importance rating on government stimulus package	Discrete variable with 5 unique values	Appendix 1 Q8-1
<i>Stock Price Consideration</i>	Importance rating on stock price	Discrete variable with 5 unique values	Appendix 1 Q8-2
<i>CPI Consideration</i>	Importance rating on consumer price indexes	Discrete variable with 5 unique values	Appendix 1 Q8-3
<i>IR Consideration</i>	Importance rating on bank interest rate	Discrete variable with 5 unique values	Appendix 1 Q8-4
<i>Export Consideration</i>	Importance rating on decline in export	Discrete variable with 5 unique values	Appendix 1 Q8-5
<i>GDP Consideration</i>	Importance rating on GDP growth rate	Discrete variable with 5 unique values	Appendix 1 Q8-6
<i>Employment Consideration</i>	Importance rating on employment rate	Discrete variable with 5 unique values	Appendix 1 Q8-7
<i>Bankruptcy Consideration</i>	Importance rating on Company closing down/bankrupt	Discrete variable with 5 unique values	Appendix 1 Q8-8
<i>Layoff Consideration</i>	Importance rating on layoff workers	Discrete variable with 5 unique values	Appendix 1 Q8-9

Panel F: Variables correlated to anxiety

I. Proxy for anxiety

Variable Name	Description	Type	Resource/ Evaluation
<i>SA (State anxiety specific on GFC)</i>	Degree to which investor feel anxious on the Global Financial Crisis	Discrete variable with 17 unique values, [1,5]	The scale formed from the four variables measuring respondents' uneasy, nervous, worry and fear feeling on GFC using Cronbach's alpha computing.
<i>TA (Trait anxiety)</i>	Individual's intrinsic propensity to feel anxious, conceptually close to the Psychology term Trait Anxiety	Continuous variable, [-2.63, 2.43]	Residual of the regression of SA on impacts caused by GFC and a variety of environmental variables
<i>HTA (High Trait Anxiety Dummy)</i>	An indicator for whether an individual's TA score is relatively high among sample respondents', with stereotype as an emotionally nervy person.	Dummy	High Trait Anxiety Dummy=1 if TA is one standard deviation or more higher than mean, zero otherwise
<i>LTA (Low Trait Anxiety Dummy)</i>	An indicator for whether an individual's TA score is relatively low among sample respondents', with stereotype as an emotionally stable person.	Dummy	Low Trait Anxiety Dummy=1 if TA is one standard deviation or more lower than mean, zero otherwise
<i>MTA (Middle Trait Anxiety Dummy)</i>	An indicator for whether an individual's TA score is in middle of those of HTA and LTA.	Dummy	Middle Trait Anxiety Dummy=1 if TA is within one standard deviation to mean, zero otherwise

II. Variables related to Neuroticism

Variable	Description	Type/value	Resource/ Calculation
<i>Psychological Well-being</i>	The extent to which GFC made change to psychological well-being	Discrete with 5 unique values	Appendix1 Q10-6
<i>Emotional Fluctuation</i>	The extent to which investment results affect mood	Discrete with 3 unique values	Appendix1 Q6
<i>Own Analysis</i>	Importance of personal analysis by self for investment decision making	Discrete with 5 unique values	Appendix1 Q1
<i>Consultant Advice</i>	Importance of consultants' opinion for investment decision making	Discrete with 5 unique values	Appendix1 Q1
<i>Grapevine News</i>	Importance of grapevine news for investment decision making	Discrete with 5 unique values	Appendix1 Q1
<i>Satisfaction on Life</i>	Satisfaction level on life overall	Discrete with 10 unique values	Appendix1 Q11
<i>Overall</i>	Satisfaction level on job overall	Discrete with 5 unique values	Appendix1 Q12-9
<i>Pay</i>	Satisfaction level on pay of current job	Discrete with 5 unique values	Appendix1 Q12-1
<i>Hours of Work</i>	Satisfaction level on hours of work	Discrete with 5 unique values	Appendix1 Q12-2
<i>Relationship with Co-workers</i>	Satisfaction level on interpersonal relationship between co-workers	Discrete with 5 unique values	Appendix1 Q12-4
<i>Fringe Benefits</i>	Satisfaction level on job fringe benefit	Discrete with 5 unique values	Appendix1 Q12-6
<i>Job Stability</i>	Satisfaction level on Job Stability	Discrete with 5 unique values	Appendix1 Q12-7
<i>Job Security</i>	Satisfaction level on Job Security	Discrete with 5 unique values	Appendix1 Q12-8
<i>Optimism on Economy</i>	The extent the respondent feel optimistic about the future economy	Discrete with 5 unique values	Appendix1 Q9-7
<i>Optimism on Society</i>	The extent the respondent feel positive about future social development	Discrete with 5 unique values	Appendix1 Q9-8

Appendix 4. Index of stock markets in China at special dates during the global financial crisis

	SSE composite A share	SHE composite A share
Sept.1, 2006	1636.691	415.631
Oct. 12, 2007	5903.264	1517.631
Oct. 31, 2008	1728.786	470.911
March 6, 2009	2193.007	715.005
Sept. 4, 2009	2861.609	968.545

Appendix 5. A summary on determinants of stock ownership

1. Financial Characteristics

Determinant	Effect on stockownership	Evidence
Wealth and Income	strong positive	Guiso, Haliassos, and Jappelli (2003); Mankiw and Zeldes (1991); Vissing-Jørgensen and Attanasio (2003)
Background risk	negative	Bertaut and Haliassos (1995); Campbell (2006); Edwards (2008); Rosen and Wu (2004); Vissing-Jørgensen and Attanasio (2003)

2. Demographic Characteristics

Determinant	Effect on stockownership	Evidence
Education	strong positive	Bernheim and Garrett (2003); Campbell (2006); Cole and Shastry (2009); Haliassos and Bertaut (1995); Van Rooji, Lusardi and Alessi (2007)
Age	hump-shape pattern	Ameriks and Zeldes (2004)
Gender	No uniform conclusion	Barber and Odean (2001); Jianakoplos and Bernasek (1998); Sundén and Surette (1998)
Marital status	positive	Love (2010)

3. Innate preference

Determinant	Effect on stockownership	Evidence
Risk aversion	strong negative	Guiso, Haliassos, and Jappelli (2003); Jianakoplos and Bernasek (1998); Sundén and Surette (1998); Vissing-Jørgensen and Attanasio (2003)
Gambling	Some gamble in stock market instead rationally invest	Kumar (2009)
Trust	positive	Georgarakos and Pasini (2011); Guiso, Sapienza and Zingales (2008)
Sociability	positive	Brown, Ivković, Smith, and Weisbenner (2008); Hong, Kubik and Stein (2004); Kaustia and Knüpfer (2012)
Personal values	depends	Kaustia and Torstila (2011)

4. Knowledge and ability

Determinant	Effect on stockownership	Evidence
Financial literacy	positive	Van Rooij, Lusardi, and Alessie (2011)
Awareness	positive	Guiso and Jappelli (2005)
IQ	positive	Grinblatt, Keloharju, and Linnainmaa (2011)
Cognitive abilities	positive	Benjamin, Brown and Shapiro (2005); Christelis, Jappelli, and Padula (2010); Cole and Shastry (2009); Dohmen, Falk, Huffman, Sunde, Schupp and Wagner (2011); Korniotis and Kumar (2011)

5.External Environment

Determinant	Effect on stockownership	Evidence
Social and Cultural influence	depends	Grinblatt and Keloharju (2001a); Kaustia and Knüpfer (2008); Shefrin and Statman (2000); Shiller (1984); Stulz and Williamson (2003)
Peer performance	positive	Brown Ivković, Smith, and Weisbenner (2008); Hong, Kubik, and Stein (2004); Kaustia and Knüpfer (2012)

6.Others

Expectation	depends	Bonaparte and Fabozzi (2011)
Mistake	negative	Calvet, Campbell, and Sodini (2009a); Calvet, Campbell, and Sodini (2009b); Campbell (2006); Campbell, Jackson, Madrian, and Tufano (2011); Haliassos and Bertaut (1995)

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