Stock Market Expectations and Risk Aversion of Individual Investors

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Abstract

We study the relationship between stock market return expectations and risk aversion of individuals and test whether the joint effects arising from the interaction of these two variables affect investment decisions. Using data from the Dutch National Bank Household Survey (DHS), we find that risk aversion levels have significant and negative effects on stock market expectations. We identify significant negative effects arising from the interaction between stock market expectations and risk aversion. These effects are in addition to a significant positive impact from stock market return expectations as well as a significant and negative effect from risk aversion separately. Moreover, once individuals participate in the stock market, their stock market expectations alone remain significant in determining their portfolio allocation decisions.

Keywords: Portfolio Allocation, Stock Market Expectation, Risk Aversion, Individual Investor.

JEL Codes: G10, G11, G12

1. Introduction

The Amsterdam Stock Exchange founded in the early 1600s and still in existence (as part of NYSE Euronext) is considered to be the oldest the stock exchange in the world.[1] Accordingly, one might think that Dutch investors would embrace stock market investing. Curiously, in the Netherlands as well as other countries, individual participation in equities is relatively low. Looking at cross–country data, Guiso, Haliassos, and Jappelli (2003) find that the percentage of households investing in the stock market ranges from 15-25% in the Netherlands, Italy, France, and Germany to about 50% (for the U.S. and Sweden). These results persist after controlling for differences in household wealth, income, age, and education. Previous research has indicated that heterogeneous stock market expectations of individuals may explain individual stock market participation,[2] while work by others has found that systematic variations in individualions of individuals may explain is their portfolio allocation decisions.[3] The objective of this paper is to look at the interaction between return expectations and risk aversion, and to investigate how these two factors, both individually and combined, influence stock market participation.

We obtain both individuals' stock market expectations and risk aversion levels from the Dutch National Bank Household Survey (DHS) over the period 2004-2006. We measure individuals' stock market expectations from a question that elicits individuals' expectations of stock price changes one year ahead on the basis of point forecasts in a fashion similar to Vissing-Jørgensen (2003). Our risk aversion measure is obtained from a series of questions evaluating individuals' risk preferences in terms of investment strategy. We use the approach suggested by Kapteyn and Teppa (2011) to obtain individuals' risk aversion levels by

[1] See Amsterdam Stock Exchange at http://www.nyx.com/who-are-we/history/amsterdam
[2] See Dominitz and Manski (2007), Hurd, Van Rooij, and Winter (2011).
[3] See Barsky, Juster, Kimball, and Shapiro (1997), Donkers and Van Soest (1999), and Kapteyn and Teppa 2011).

applying factor analysis to survey responses. Our analysis is based on detailed information on individuals' financial, demographical, and behavioural characteristics that is available from the covariate-rich Dutch household survey.

We use this data to account for the negative effect of risk aversion on stock market return expectations of individual investors. We then disentangle the effect of risk aversion from that of return expectations using different measures of both variables from those employed by Hurd *et al.* (2011). We do this by first considering whether individuals' stock market expectations depend on their levels of risk aversion. Second, we study whether individuals' stock market expectations and their risk aversion levels jointly determine their stock market participation decisions. Third, we test whether stock market investors' expectations and their levels of risk aversion jointly determine their portfolio allocation decisions, i.e. the proportion of equity assets held in their financial portfolios.

Our paper contributes to the literature by addressing the effect of risk aversion in linking individuals' stock market expectations to their stock market participation decisions. Additionally, we consider the problem of endogeneity more rigorously than prior work does. Our empirical analysis shows that risk aversion levels of individuals affect their stock market expectations, significantly and negatively. We also find that there are significant and negative interactions between stock market expectations and risk aversion levels on stock market participation decisions, in addition to their significant separate effects. Finally, we find that only stock market expectations exhibit significant and positive effects on portfolio allocation decisions, while the effect of risk aversion and of the interactions between stock market expectations and risk aversions are not significant. These findings confirm that once individuals participate in the stock market, risk aversion becomes irrelevant; thus we observe no significant interactions between stock market expectations and risk aversion. Nevertheless,

individuals' stock market participation decisions are significantly influenced by both their expectations and their levels of risk aversion.

In the remainder of this paper, we discuss our data and constructions of variables in section 2; we develop our empirical models and present the results and robustness checks in section 3; and finally, we summarise and discuss our findings in section 4.

2. Previous research

The Capital Asset Pricing Model assumes that all investors apply the same theoretical economic model to form the same expectation of market return and risk. Hong and Stein (2007) argue that even though investors use the same publicly available information, they use different economic models, which causes their interpretation of information to diverge from each other. Similarly, Hurd (2009) argues that heterogeneous beliefs are likely to be caused by deviations in the manner that investors access and process publicly available information. Vissing-Jørgensen (2003) finds that the heterogeneous beliefs of American investors are correlated with their investment choices, with those who expect higher stock returns holding higher proportions of equity in their portfolios. Dominitz and Manski (2007) also argue that heterogeneity in expected returns is reflected in individuals' stock holdings, with the probability of holding stocks increasing as U.S. households' perceive a likelihood of positive equity returns increases. Both Vissing-Jørgensen (2003) and Dominitz and Manski (2007) find that substantial heterogeneity in beliefs reflects demographical and financial characteristics.

Hurd *et al*. (2011) find, consistent with previous U.S.-based studies such as Dominitz and Manski (2007), that substantial heterogeneity in the stock market expectations of Dutch households is a significant influence on their stock ownership. They argue that those households with expectations of higher future returns are more likely to own stocks, and those with expectations of higher volatility in returns are less likely to do so. Based on a

larger set of covariates, Hurd *et al.* (2011) also consider the influences of socio-demographic information, personal traits (including factors such as optimism, trust, and risk aversion) and investment behaviour (including factors such as whether investors have recently traded, or follow the stock market closely) on investors' expectations.

Dominitz and Manski (2007) find that many investors are not as convinced as are economists about the existence of an equity premium, as they observe that nearly two-thirds of US households believe that the probability of positive nominal equity returns is less than fifty per cent. Assuming that all individuals face the same risk-free rate and perceive the same level of uncertainty as to equity returns, Dominitz and Manski (2007) argue that the subjective probability of perceived positive nominal returns on equity determines the probability of equity holding.

Barsky, Juster, Kimball, and Shapiro (1997), Donkers and Van Soest (1999), and Kapteyn and Teppa (2011) argue that different types of individuals are characterised by varying levels of risk aversion, related to their background and wealth characteristics. Subsequently, Hurd *et al.* (2011) address individuals' risk aversion as an influential factor on stock market expectations. They find, however, that risk aversion has only a limited effect on both individuals' expected stock market returns and volatility, and on their stockholding decisions. Thus, they conclude that individuals' stock market expectations alone explain the stock holding puzzle adequately, without a need to invoke very high levels of risk aversion.

3. Data description and construction of the variables

3.1 Data and Sample Selection

This study uses the Dutch National Bank Household Survey (DHS) which is an online survey conducted by the CentERpanel of CentERdata, an affiliate of Tilburg University in the Netherlands. Since 1993, this survey has been completed annually by approximately 3,000 panel members over 16 years old from about 2,000 households. The panel is representative

for the Dutch population.[4]On average, the DHS takes 7 to 8 months to obtain data covering the entire survey.

The DHS only included a supplementary question on stock market expectations of individuals during the period from 2004 to 2006. This period includes a market rebound and modest recovery, with a revival starting in 2003, after three years of declining stock market prices worldwide following the dot-com crisis of 2001. Figure 1 presents the historical performance of both the Dutch (AEX) stock market index and the MSCI World Total Return Index from 2000 to 2009. This picture shows the recovery of the indexes in the period 2004-2006.[5]

[Please Insert Figure 1 here]

The panel questions are only asked during the weekend and most respondents answer during the first weekend that the questions are available. The stock market return question was released around late spring, and the majority of members answered on the 16th, 19th and 16th weekend of the years 2004, 2005, and 2006, respectively. We specify the response dates for the majority of individuals each year by drawing vertical lines in the graph in Figure 1.

Our sample selection process is presented in Panel A of Table 1.

[Please Insert Table 1 here]

The participation rate is around 74% and includes 13% '*I don't know*' responses. We exclude missing values as well as '*I don't know*' responses. We then construct our panel dataset by merging the expectation question with the datasets of the *General Information on the Household* section to obtain respondents' demographical backgrounds; the *Aggregate*

[4] Previous studies that have used the CentERpanel for finance topics include Guiso, Sapienza, and Zingales (2008) who investigate trusting the stock market and Van Rooij, Lusardi, and Alessie (2011, 2012) who study the effect of financial literacy on stock market participation, retirement planning, and household wealth. Kaplanski, Levy, Veld, and Veld-Merkoulova (2013) have used the LISS panel; a similar panel ran by CentERdata, to study the effect of sentiment-creating factors on predictions of individual investors on stock market return and risk.

[5] According to the Statistical Bulletin (June 2006, page 21-25) reported by the Dutch National Bank, Dutch private investors, on average, hold about 35% of their portfolios in foreign securities, indicating that the remainder is invested in the Netherlands. For that reason we also include the MSCI World Total Return Index in Figure 1.

dataset of Asset and Liabilities that provides information about respondents' asset allocations, (we exclude missing values and those with zero financial assets); and the *Economic and Psychological Concepts* section which includes questions allowing us to measure risk aversion and other behavioural factors. We obtain a total of 2,956 observations from 1,587 individuals over 3 years.

Panel B of Table 1 provides background characteristics. From this panel we can see that the sample composition is stable over all years. Over our entire sample, we observe the following characteristics: 36% of the respondents are female, and 64% are male respondents; 76% are married or living with a partner; 18% are less than 35 years old, 28% are between 36 and 50, 35% are between 51 and 65, and 19% are over 65; and 48% have received a vocational college or university education. A little more than half are regularly employed; 4% are self-employed; 22% are retired, 12% are unemployed; less than 8% have other employment statuses; and about 75% own their house.

The DHS specifies detailed information concerning the assets, liabilities and mortgages of the panel members. The aggregated data set includes a total of twenty-four main asset components, eight debt components, and three mortgage components.[6] From the list of financial assets, we define risky financial assets as the sum of individual company shares, mutual funds, options, and equities in their own business.[7] We treat other financial assets as non-risky, comprising savings and checking accounts, bonds, single-premium annuity insurance policies, employer sponsored savings plans, money lent to friends and family, and other savings or investments. Net worth is calculated by deducting total debts from total assets. Total assets comprise financial and fixed assets including real estate, and

[6] Values are determined by the market value on the last day of the previous year, e.g. in 2004, values are recorded as at 31 December 2003.

[7] The DHS does not specify subcomponents of the mutual fund category. Thus, if investors hold balanced funds, this category will include some element of fixed income ownership. According to Alessie, Hochguertel, and van Soest (2004), about 50% of the total amount in mutual funds was invested in the stock market; about 30% in the real estate; and about 10% in bonds in the Netherlands.

owners' houses and cash value of insurance on real estate and owners' houses. Debts include private loans, extended lines of credit, debt with mail-order firms, loans from family and friends, student loans, credit card debt, and other debts, as well as mortgages on real estate and owners' houses. We report quartile values of individuals' financial assets[8] and net worth in Euros. Over our entire sample, about 34% of the participants are investors; about 33% (median) of their financial asset portfolios contains risky financial assets.

3.2 Survey Questions and Construction of Variables

3.2.1 Measuring Subjective Stock Market Expectations

Individuals' stock market expectations are estimated by their point forecasts in a similar way as Vissing-Jørgensen (2003). The wording of the stock market expectation question that we use in this study is as follows:

"How do you expect the worldwide stock prices to move over the next two years - will stock prices increase, decrease or remain about the same? How many percentage points do you expect them to increase or decrease per year?"

The question combines two parts to elicit individuals' expectations with regard to the direction of future stock price movements, and changes in the magnitude of future returns. For our study, we only use expected changes in magnitude.

Table 2 presents descriptive statistics of the survey results from the individuals' subjective stock market expectations question.

[Please Insert Table 2 here]

To control for extreme outliers, we undertake a 99% winsorisation of each year's responses. In 2004, individuals indicate that they expect mean (median) stock prices will increase over the next two years by 3.82% (2%) per year; in 2005, the mean (median)

[8]Although we do not have information on individuals' retirement account, Dimmock and Kouwenberg (2010) note that in the Netherlands, the system of employer pensions covers most employees, as it is controlled by the state and over 99% of these pensions are defined-benefit plans. Although we are aware that tax deferred equity investment in retirement accounts could influence individuals' private investment decisions, we are unable to account for the effects in this study.

expected rate decreases to 2.35% (0%) in 2005; in 2006, individuals expect a mean (median) increase of 3.94% (3%).

We observe that individuals' expected stock market return forecasts are much lower than the historical averages. The geometric average annual rate of return calculated from the AEX total return index over 1983-2006 is 14.1%, and that from the MSCI World total return is 11.4%. For our survey that covers the period 2004-2006, the geometric average annual rate of returns are 13.75% and 13.53%, respectively, as calculated from the AEX and MSCI World total return indices. Thus, our findings reinforce those of Hurd *et al*. (2011) as to the pessimistic views regarding the stock market held by Dutch individuals.

Following Dominitz and Manski (2007), we also account for individuals' perception as to the existence of an equity premium, in addition to the magnitude of their expectations. From the distribution of individuals' responses, we observe that only about fifty per cent of individuals expect a premium for holding stocks. The percentages of respondents who expect positive stock returns over the years 2004, 2005, and 2006 are 53%, 43%, and 60%, respectively.

To test whether there is a significant shift to more optimistic views in 2006, we undertake a binomial probability test. Our test result confirms that the probability of positive expectations in 2006 is significantly higher than in 2004 (at the 1% level). The percentage of positive expectations in 2005 is significantly lower than in any other year (at the 1% level). A significant drop both in the percentage of individuals expecting positive returns, as well as in the magnitude of returns expected in 2005 indicates that individuals' expectations are affected strongly by the most recent stock market performance prior to the dates when the survey was executed. Figure 1 indicates that individuals' responses are obtained immediately following a small decline in stock prices. This supports the arguments of De Bondt (1993, 1998) and Graham and Harvey (2001) that individuals' expectations are influenced strongly by their

recent experiences.

By comparing both the mean and median values each year, Table 2 also shows that investors expect significantly higher stock market returns than do non-investors. This systematic difference in expectations between investors and non-investors highlights the issue of causality between stock market expectations and stock ownership. Investors may hold higher expectations about stock market return because of their 'wishful expectations' (Ito, 1990). Alternatively, these expectations may reflect factors, such as familiarity with the recent stock market history, and belief in the existence of an equity premium. Therefore we treat the stock market expectations variable as endogenous in order to better understand the direction of the relation.

3.2.2 Measuring Risk Aversion

We measure risk aversion of individuals based on six questions available at the DHS that evaluate individuals' risk preferences in terms of investment strategy. Table 3 presents descriptive statistics including values of mean, median, and standard deviations from individuals' responses on six questions (R1-R6) over three years.

[Please Insert Table 3 here]

Individuals indicate whether or not they agree or disagree with six statements on a scale from 1 (totally disagree) to 7 (totally agree), such as, "*I think it is more important to have safe investments and guaranteed returns than to take a risk to have a chance to get the highest possible returns*". Questions R1, R2, and R4 are concerned with the strength of individuals' preferences for safe investments; while questions R3, R5, and R6 are concerned with individuals' appetite for incurring risk in order to maximise possible profits. Individuals' responses for questions R3, R5, and R6 are therefore reversed in order to ensure that, in the case of all questions, the lowest point on the scale represents the least risk averse while the highest point on the scale represents the most risk averse.

Following the approach of Kapteyn and Teppa (2011), we elicit the risk aversion of individuals by an application of factor analysis to survey responses. Including all six questions, we apply a Principal Components Analysis (PCA) to create one factor variable. We report communalities and factor loadings from each risk preference question in Table 3. Communalities indicate the reliability of the factor variable presenting the percentage of variance of each question explained by the factor. Factor loadings are the measure of correlation coefficients between each risk preference question, i.e. the components of factor variable, and the factor variable estimated from the PCA (Jolliffe, 2005). The risk aversion factor variable has a mean of zero and variance of one, which correlates more than 50% with the responses for each question.

Kapteyn and Teppa (2011) argue that eliciting risk aversion by the relatively simple approach of factor analysis by utilising survey responses is more powerful than that of Barsky *et al*. (1997) and Kimball *et al.* (2007) which is based on complex economic theory.[9] We follow the Kapteyn and Teppa suggestion and use their measure of risk aversion in the remainder of the paper.

In order to test whether the risk aversion factor captures the heterogeneity among individuals, we run a cross-sectional pooled linear regression by estimating the following equation:

$$(1) \qquad Risk_{i,t} = \alpha + \beta x'_{i,t} + \delta z'_{t} + \varepsilon_{i,t}$$

The dependent variable, $Risk_{i,t}$, denotes an individual *i*'s risk aversion factor at time *t*. $x'_{i,t}$ is a vector of demographical and financial characteristics measured for each year *t* including gender, marital status, age group, education level, employment status, house ownership status, financial assets, and net worth. z'_{t} is a vector of year indicator variables.

[9] Barsky *et al.* (1997) develop a hypothetical question that estimates respondents' willingness to take a gamble on a 50:50 chance of either doubling their current income or having it reduced by a third. Kimball *et al.* (2007) extend the scenarios further by incorporating varying levels of downside risk.

The standard errors are clustered by individuals and are robust to heteroskedasticity. The results are reported in Table 4.

[Please Insert Table 4 here]

Table 4 starts with the full model (1). In addition, due to high multicollinearity between age group and employment status, and between financial assets and net worth quartiles[10], we present models (2) – (5) which exclude each categorical variable which is subject to multicollinearity. Our results in Table 4 support previous research findings of Barsky *et al*. (1997) and Kapteyn and Teppa (2011) that individuals' hold heterogeneous risk preferences. Females and older individuals are much more risk averse than males and younger individuals. Better educated individuals are relatively less risk averse. Self-employed individuals are less risk averse, while retired individuals are more risk averse (which is similar to older individuals) than those in regular employment. Individuals whose holdings of financial assets are in the top quartile are less risk averse than those whose holdings occupy the lowest quartile of the distribution, confirming a significant wealth effect. The opposite signs from the holdings of net worth observed in models (1)–(3) disappear when financial assets quartiles are dropped in model (5), which indicate that there is no variation between the upper quartiles of net worth and the lowest quartile of the distribution (no significant variation of risk aversion is also observed in the univariate test).

Although Hoffmann, Post, and Pennings (2013) find that individuals' risk tolerance and perception fluctuate over time like their stock market expectations, we do not observe a significant year effect, indicating that the risk aversion of individuals during the survey period remains stable. The relation between the risk aversion factor of individuals and their

[10] From the full model (1) at Table 4, we obtain the mean Variance Inflation Factor (VIF) of 1.95, and the highest VIF value of 3.99 from the age group category, 65<Age. Although these values are much lower than the rule of the thumb value of 10 for a severe multicollinearity within the model (O'Brien, 2007), there are significant relationships between age, group and employment status, and also between financial assets and net worth quartiles according to Pearson Chi-squared tests (these results are available on request from the authors). Thus, we exclude each variable from the regression (2) – (5) to see whether the collinearity of these variables affect the size of coefficients and the significant levels of other variables.

stock market return expectations is significantly negative with a Pearson correlation coefficient of -12.84% (significant at the 1% level). In order to investigate the interactions between stock market expectations and risk aversion of individuals, we create a dummy variable that determines high and low levels of risk aversion in the factor variable at a cut-off point of zero. Within the sample period, about 20% of individuals move from the low to the high level of risk aversion, while about 20% move from high to low. Again, our sample results demonstrate that most individuals, but not all, remain at the same risk aversion level over time, although we acknowledge that this phenomenon could be time specific regarding the upward trend in the stock market during our sample period. Overall, our risk aversion measure captures significant heterogeneity reflecting individuals' demographical and financial backgrounds.

3.2.3 Other factors

We identify other factors that influence both individuals' stock market expectations and portfolio allocation decisions. In Appendix A, we present both survey questions and mean values for these dummy variables. In responding to the DHS, individuals are requested to indicate as to how knowledgeable they consider themselves to be with regard to financial matters. Van Rooij, Lusardi, and Alessie (2011, 2012) document that investors of higher financial literacy are able to undertake more advanced economic evaluations. Based on individuals' self-evaluated financial knowledge levels, we identify whether those who believe themselves to be highly knowledgeable investors form their expectations and investment decisions differently from those who perceive themselves as the opposite. Additionally, we assess whether individuals' expectations vary depending on the source of advice they receive, broadly categorised as (1) parents and friends, (2) the media, (3) professional advisers, and (4) others. Canner, Mankiw, and Weil (1997) point out that disclosure of individuals' most important financial sources of advice reveals the most important influences on them when

forming expectations. According to Shiller (1990), investors' mental frames are shared socially, and easily manipulated by the news media, discussions with families and friends, and recommendations from financial advisors. Similarly, De Bondt (1998) states that investors' seemingly irrational behaviour reflects the popular financial advice they receive, arguing that many individuals make investment decisions which lack rigorous consideration, being based on impulse or on random tips from acquaintances. Furthermore, De Bondt (1998) argues that those investors who rely on the most informal advice tend to be more pessimistic in their attitude to risk. In contrast, those who receive advice from professional finance advisors are more likely to be investors.

4. Empirical results

4.1. Risk aversion on stock market expectations

In order to test whether individuals' stock market expectations are affected negatively by risk aversion, we develop the following equation:

$$(2) \qquad Ex_{i,t} = \alpha + RA_{i,t} + \beta x'_{i,t} + \gamma y'_{i,t} + \delta z'_{t} + \varepsilon_{i,t}$$

The dependent variable, $Ex_{i,t}$, denotes individual i's expectation of stock market returns (percentage) at time t. $RA_{i,t}$ is a dummy variable for higher risk aversion which is defined 1 for those who have a value of risk aversion factor above zero, and 0 for those with the factor value zero or below . $x'_{i,t}$ is a vector of demographical and financial characteristics measured for each year including gender, marital status, age group, education level, employment status, house ownership status, financial assets, and net worth. $y'_{i,t}$ is a vector of other factors including self-evaluated financial knowledge level and source of most important financial advice. $z'_{t}$is a vector of year dummies. The standard errors are clustered by individuals and are robust to heteroskedasticity. Table 5 presents the estimation results of regression (2).

[Please Insert Table 5 here]

Model (1) is the full model. Due to high multicollinearity between age group and employment status, and between financial assets and net worth quartiles, estimations (2) – (5) exclude highly correlated variables from the full model.

We observe significant and negative effects arising from individuals' risk aversion levels that results in lower stock market expectations for more risk averse people. The risk aversion coefficients are very similar across the models. Females expect much lower stock market returns than males, consistent with the finding of Hurd *et al.* (2011) that females are much more pessimistic than males. Individuals with a high level of education (college or university) have more optimistic stock market expectations, and those who are over 65 have lower expectations. In model (2), where the employment status is excluded, the age effect becomes more significant (at the 5% level). Likewise, in estimation (3), where the age effect is excluded, those individuals who are retired have significantly lower stock market return expectations (at the 1% level). As shown in estimations (4) and (5), individuals in higher financial assets and net worth quartiles, respectively, expect significantly higher stock market returns than those in the lowest quartiles.

In all regressions, the effect of individuals' self-evaluated financial knowledge level is significant at the 1% level. Those with higher levels of self-evaluated financial knowledge have higher expectations than those perceiving themselves as less knowledgeable. The effect of the most important source of financial advice is also significant. Compared to those who rely on the most informal source of advice, i.e., advice from family and friends, individuals who receive advice from the media, professional financial advisors, and other sources expect significantly higher returns. When looking at the year dummies, we observe that individuals' stock market expectation in year 2005 is significantly lower than in year 2004, but not in year 2006, as discussed previously.

Overall, we conclude that individuals' stock market return expectations are heterogeneous, and this heterogeneity is determined significantly by their levels of risk aversion. These expectations also reflect significant effects arising from other control variables including demographical, financial, and behavioural factors in the model as well as changes in their expectations over time.

4.2 Stock Market Participation and Portfolio Allocation Decisions

The stock market expectations of individuals are influenced by the closeness with which they follow the market and their awareness of, and familiarity with, market history. Stock market returns expectations of those individuals who have no experience of investing in stocks may be based on mere speculation, reflecting poor quality information and confidence. Also, among stock investors the proportion of equity held in their financial portfolios may also affect their stock market return expectations. Furthermore, stock market expectations are likely to be correlated with other unobserved variables influencing stock market participation and stock holding, including factors such as personal experiences of economic fluctuations (Malmendier and Nagel, 2011), individuals' information set which reflects their preceding stock market expectations (Arrondel, Calvo-Pardo, and Tas, 2012), and varying levels of cognitive capacity (Christelis, Jappelli, and Padula, 2010), which we are unable to identify due to data availability.

Since we recognise the problem of endogeneity, we apply instrumental variables (IV) estimations including additional variables as instruments to investigate the combined effect of stock market expectations and risk aversion on individuals' stock market participation decisions and on investors' portfolio allocation decisions, respectively. The first instrument we consider is that of individuals' expectations as to their own financial situation a year ahead and, in particular, whether it will improve, stay the same or deteriorate. According to Vissing-Jørgensen (2003), individuals' expectations reflect their own situation. Thus,

individuals may form stock market expectations related to their expectations as to their own financial situations. The second instrument which we consider is individuals' investment horizons. Specifically, we look at whether an individual's most important time-horizon with regard to planning expenditures and savings is 'a couple of months', 'the next year', 'the next couple of years', or 'more than five years'. Differing investment horizons can lead to individuals holding distinctive attitudes towards different assets (Veld-Merkoulova, 2011), which in turn influence stock market expectations.

In terms of our model, consideration of stock market expectations as an endogenous variable implies that the related interaction term with risk aversion is also endogenous. Thus, we control for two endogenous variables in our model. To account for the endogenous interaction term, we include additional instruments created by multiplying the risk aversion dummy variable by our two categorical dummy instruments.

We develop instrumental variable (IV) estimates applying the Generalised Methods of Moments (GMM) to control for unknown forms of heteroskedasticity within our linear regression models to produce efficient and consistent estimations as proposed by Hansen (1982)[11] based on the following equation:

$$(3) \qquad S_{\mathrm{i,t}} = \alpha + Ex_{i,t} + RA_{i,t} + Ex_{i,t} \times RA_{i,t} + \beta \mathrm{x'_{i,t}} + \gamma \mathrm{y'_{i,t}} + \delta \mathrm{z'_{t}} + \varepsilon_{i,t}$$

We specify two models: GMM (1) for individuals' stock market participation decision and GMM (2) for investors' portfolio allocation decisions. In GMM (1), the dependent variable is a qualitative dichotomous variable, describing individuals' stock market participation decisions. $S_{\mathrm{i,t}}$, is equal to 1, if individual *i* holds any risky financial assets at time *t*, and 0 otherwise. In GMM (2), the dependent variable, $Share_{\mathrm{i,t}}$, is the proportion of risky financial assets relative to total financial assets held by investor *i* at time *t*. In GMM (2), we only include investors in our sample i.e. those individuals who hold risky financial assets.

[11] For further discussion, see Hayashi (2000, pages 227-228, 407, and 417), and for the application of the model, see Baum, Schaffer, and Stillman (2003), and Baum (2006, Chapter 8. Instrumental-variables estimators).

We include individuals' percentage stock market return expectations, $Ex_{i,t}$, high risk aversion dummy, $RA_{i,t}$, and their interaction term as explanatory variables. The remaining control variables in equations (3) are the same as for equation (2). The standard errors are corrected for heteroskedasticity and for intra group correlations clustered by individuals as specified in Wooldridge (2002). In Table 6, we report the second-stage regression estimates for the two-stage IV GMM (1) and GMM (2).[12]

[Please Insert Table 6 here]

Since the estimates of the explanatory variables are unaffected by multicollinearity issues within the model, we only report the full models. The GMM (1) model indicates that the effect of individuals' stock market expectations on their stock market participation decisions is significant and positive, i.e. individuals who expect higher stock returns are more likely to own stocks. The effect of individuals' risk aversion on their stock market participation decision is also significant but negative, meaning that those who are more risk averse are less likely to participate in the stock market than those who are less risk averse. With regard to the interaction between stock market expectations and risk aversion, we observe a negative and significant coefficient (at the 10% level). This means that high risk aversion moderates the positive effect of expectations on stock market participation. In general, the coefficients and significance levels of the other control variables are consistent with previous research findings identifying stockholders' characteristics.

In the GMM (2) model reported in Table 6, we observe a significant positive influence of investors' stock market expectations on the proportion of risky assets held in their financial portfolios, while risk aversion and the interactions between stock market

[12] We check the validity of our models and instruments following the interpretations from Baum, Schaffer, and Stillman (2010). The first-stage regressions results confirm that the instruments have strong predictive power for each endogenous variable (Details are available on request from the authors.) The Angrist-Pischke (AP) *F*-statistics tests for excluded instruments significantly reject the null hypothesis that the endogenous variable is unidentified (Angrist and Pischke, 2009; pages 217-218). The AP *F*-statistics for excluded instruments in GMM (1) equal 6.28 and 4.58, and for GMM (2) equal 6.53 and 5.54, for the endogenous variables of the stock market expectations and its interaction term with risk aversion, respectively.

expectations and risk aversion are no longer significant. In other words, once individuals have participated in the stock market, risk aversion ceases to play a role.[13]However, the proportion allocated to risky assets in investors' financial portfolios is significantly determined by their expectations of stock returns. Holding all other variables constant, a one percentage point increase in their expectations increases the proportion of risky financial assets held in investors' financial portfolios by 2%. Our results support Vissing-Jørgensen (2003), who finds that investors with higher stock market return expectations hold a higher proportion of equity in their portfolios.

We confirm the validity of our model and of the instrumental variables by conducting the Kleibergen-Paap test for underidentification (Kleibergen and Paap, 2006). The reported Kleibergen-Paaprk LM statistics for cluster-robust standard errors[14] rejects the null hypotheses that any of the endogenous variables is underidentified.

We further conduct both endogeneity tests on the two endogenous variables under the null hypothesis that the endogenous variable can actually be treated as exogenous following Baum, Schaffer, and Stillman (2010). For each of our endogenous variable, the tests reject the null hypothesis, confirming that we treated these variables correctly in that the stock market expectations variable and its interactions with risk aversion are endogenous. Moreover, by applying IV estimates we obtain consistent coefficients. We use the C-statistic (Hayashi, 2000), to test for the orthogonality conditions our instruments as well as risk aversion dummy variable. As reported in Table 6, the tests confirm the orthogonality conditions of these variables, as they all fail to reject the null hypothesis.

4.3 Robustness checks

[13] Those investors who hold risky financial assets are 35% of our total sample, and of those investors, only about 30% have a high risk aversion level.

[14] Kleibergen-Paaprk LM statistics (Kleibergen and Paap, 2006) are reported instead of the Anderson canonical correlations likelihood-ratio test (Anderson, 1984) as the standard errors in the model are not assumed to be independent and identically distributed (i.i.d.).

We extend our GMM (1) model to assess the robustness of our findings. The expectations of individuals as to their own financial situation as well as that of the stock market are possibly affected by unobserved individuals' characteristics omitted from our models. One possible control variable that may link stock market expectations to stock ownership decisions is the health status of individuals. Rosen and Wu (2004) find a negative relation between poor health and both stock ownership and the portfolio share invested in risky assets. Given that individuals are unable to diversify their health risk, Christelis, Jappelli, and Padula (2010) emphasise that it is a particular concern for elderly individuals who are typically faced with higher health risk.

We identify the perceived health status of individuals by using the following question from the DHS: "*Compared to one year ago, would you say your health is better now or worse?*" Individuals' responses are categorised as 'better', 'about the same', or 'worse'. Appendix A presents the mean values for each response category of the health control variable. We run GMM (1) including an indicator variable which takes one a value of 1 for responses indicating an improvement in health and 0 for all other response. In the interest of clarity, we report only the estimates of stock market expectations, risk aversion and their interactions, and the additional control variable.

[Please Insert Table 7 here]

From Table 7, we see that the effect of health status on stock ownership is negative as expected, although it is not significant. Stock market expectations and risk aversion are significant with positive and negative signs, respectively. The interaction between stock market expectations and risk aversion remains negative and statistically significant (at the 10% level) with the incorporation of the health control variable. Moreover, the inclusion of this variable affects the magnitude of the coefficients to only a minor extent.

We also undertake several other robustness checks with regard to our model specifications. Following Kapteyn and Teppa (2011), we define investors as those who hold risky financial assets comprising mutual funds, individual company shares, options, and shares in their own business. We re-estimate our models after redefining risky financial assets as the sum of financial resources invested in individual company shares and mutual funds. Our results are unaffected by this modification. In particular, in explaining individuals' stock ownership, interactions between individuals' stock market expectations and risk aversion remain statistically significant.[15]

5. Summary and conclusion

Previous studies suggest that the heterogeneous stock market expectations of individuals provide an answer to the stockholding puzzle. Consequently, we highlight the effect of risk aversion on individuals' expectations and their investment decisions. In this paper, individuals' pessimistic perceptions are captured by their risk aversion levels which fundamentally influence their perceptions when forming stock market returns expectations.

Using data from the Dutch National Bank Household Survey covering the period 2004 through 2006, we find that there are significant and negative effects from individuals' risk aversion levels that lead them to have lower stock market expectations. We also find that there are significant and negative interactions between stock market expectations and risk aversion levels in determining individuals' stock market participation decisions. This finding is robust to the inclusion of additional variables to control for individuals' health status within our model. Stock market expectations have significant and positive influence on investors' portfolio allocations. Interestingly, risk aversion and the interactions between individuals' stock market expectations and their risk aversion levels are no longer significant once they become active market participants.

[15] Detailed results are available on request from the authors.

In determining the effect of individuals' stock market expectations on their portfolio allocation decisions, we take account of the endogeneity issue with regard to investors' expectations. We use instrumental variable (IV) estimations with additional instruments to account for the causal effect. Thus, our paper contributes to the literature not only by addressing the effect of risk aversion in linking individuals' stock market expectations with their stock market participation decisions, but also by considering the endogeneity issue.

In addition to supporting previous findings of the prevalence of pessimistic views of the stock market held by individuals, our work reinforces the arguments that individuals' risk aversion levels have a permanent and negative effect on their expectations of future stock market returns. Those who are highly risk averse will forgo a high equity premium, as their stock market returns expectations are negatively influenced by their levels of risk aversion, thus preventing them from participating in the stock market. Finally, our results are supportive of the persistent effects on expectations arising from heterogeneity in individual characteristics such as risk aversion.

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Figure 1
Historical performance of the Amsterdam Stock Market Index

This figure presents the historical performance of the AEX and MSCI World Total Return Index (RI) from 2001 to 2009, which spans three years before and after our survey period. The vertical lines indicate the timing of the response from the individuals to the stock market expectation question in the Dutch National Bank Household Survey (DHS) each year.

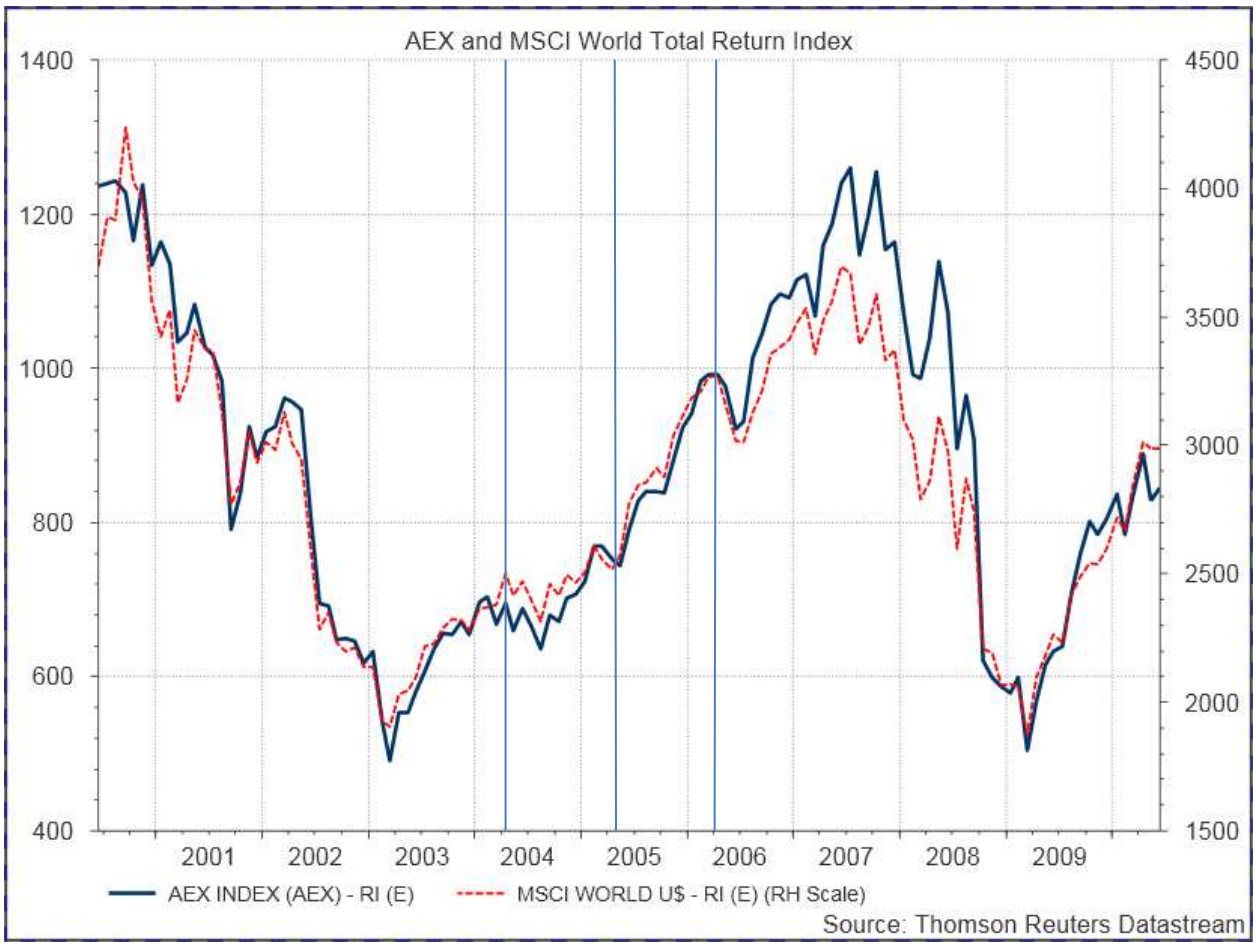

Table 1
Sample selection process and data overview.

Panel A – Sample selection process
This table presents a sample selection process in our dataset for each year. We merge the stock price expectations survey question with general information from the household, assets and liabilities, and economic and psychological concepts datasets of the Dutch National Bank Household Survey (DHS).

Sample Selection Process (Total number of Observations)	**2004**	**2005**	**2006**	**Total**
Number of individuals' contacted	2015	2056	1779	5850
Participants in Stock Market Expectations Question	1547	1522	1248	4317
	(77%)	(74%)	(70%)	(74%)
***"I don't know"* responses**	204	163	175	542
	(13%)	(11%)	(14%)	(13%)
Stock Market Expectations Question	1343	1359	1073	3775
Sample selecting process from merging with				
General Information on the Household Questions	1343	1359	1073	3775
Assets and Liabilities Questions	1186	1136	944	3266
Economic and Psychological Concepts Questions	1062	1029	865	2956
Total number of Observations	**1062**	**1029**	**865**	**2956**

Panel B – Background characteristics
We present background characteristics of our sample measured for each year. Values of individuals' total financial assets and net worth are presented in Euros. We also present percentages of stock investors in the sample and the share of risky assets in financial portfolio held by investors.

Variables		**2004**	**2005**	**2006**	**Total**
Gender	Female	0.363	0.374	0.331	0.360
Marital Status	Married	0.769	75.5	0.768	0.764
Age Groups	35 and less	0.184	0.197	0.160	0.181
	From 36 to 50	0.320	0.290	0.252	0.279
	From 51 to 65	0.319	0.346	0.390	0.349
	65 and over	0.177	0.196	0.199	0.190
Education	With college degree	0.497	0.477	0.476	0.484
Employment	Regular employment	0.562	0.538	0.513	0.540
	Self-employed	0.043	0.041	0.047	0.044
	Retired	0.199	0.216	0.245	0.218
	Unemployed	0.123	0.129	0.117	0.123
	Others	0.073	0.076	0.077	0.075
House Owner	Owner	0.754	0.740	0.751	0.748
Financial Assets	25%	€ 4,643.25	€ 4,088.94	€ 3,989.00	€ 4,284.80
(Percentile)	50%	€ 16,533.00	€ 17,280.00	€ 16,500.00	€ 16,661.99
	75%	€ 41,324.97	€ 47,184.70	€ 52,859.00	€ 45,954.19
Net Worth	25%	€ 12,311.92	€ 12,865.64	€ 13,038.00	€ 12,809.58
(Percentile)	50%	€ 68,163.18	€ 85,119.25	€ 96,504.30	€ 82,423.12
	75%	€ 216,922.38	€ 240,640.41	€ 261,755.13	€ 237,189.01
Stock Market Participation	Investors	0.339	0.344	0.347	0.343
% of Risky Financial	25%	13.36%	10.52%	13.06%	12.23%
Assets held by Investors	50%	33.84%	29.17%	36.67%	32.89%
(Percentile)	75%	56.92%	59.06%	63.83%	60.97%

Table 2
Stock market returns expectations question and results.

This table presents the results of individuals' expectations for the stock market returns over 2004-2006.. We report results separately for investors and non-investors. Each year's responses are 99% winsorised. *T*-values for the mean differences and Z-scores from Wilcoxon rank-sum (Mann-Whitney) test for the median differences between investors and non-investors responses are reported in the last two columns. *** denotes statistical significance at the 1% level, ** denotes statistical significance at the 5% level, and * denotes statistical significance at the 10% level.

Stock Market Expectations (%): "What do you expect will the stock prices do the next two years? How many percentage points do you expect them to increase or decrease per year?"

	All Individuals						***Investors***						***Non-Investors***						***Mean***	***Median***
%	***Mean***	***Median***	***S.D***	***Min***	***Max***	***N***	***Mean***	***Median***	***S.D***	***Min***	***Max***	***N***	***Mean***	***Median***	***S.D***	***Min***	***Max***	***N***	***T-Stat***	***Z-Score***
2004	3.82%	2%	7.61%	-25%	40%	1062	6.00%	5%	7.88%	-25%	40%	359	2.71%	0%	7.21%	-25%	40%	703	6.62***	8.33***
2005	2.35%	0%	6.22%	-25%	30%	1029	3.64%	2%	5.91%	-30%	30%	354	1.67%	0%	6.27%	-25%	30%	675	4.96***	6.05***
2006	3.94%	3%	6.09%	-20%	30%	865	5.51%	5%	5.40%	-10%	30%	300	3.10%	2%	6.28%	-20%	30%	565	5.89***	7.07***
Total	3.34%	2%	6.76%	-25%	40%	2956	5.03%	5%	6.62%	-25%	40%	1013	2.46%	0%	6.65%	-25%	40%	1942	9.98***	12.22***

Table 3

Risk aversion measure and principal component factor analysis.

This table presents descriptive statistics from the responses and factor analysis results. From our entire 2956 observations over three years, we create a factor based on principal component factor analysis. Individuals indicate on a scale from 1 to 7 to what extent they agree with the following statements, where 1 indicates 'totally disagree' and 7 indicates 'totally agree'. [R] indicates that individuals' responses are reversed to make consistent interpretations that the lowest scale is the least risk averse and the highest scale is the most risk averse.

Risk Preference Questions	**Mean**	**Median**	**S.D**	**Communalities**	**Risk Aversion Factor**
R1) I think it is more important to have safe investments and guaranteed returns than to take a risk to have a chance to get the highest possible returns.	5.20	6	1.59	0.411	0.641
R2) I would never consider investments in shares because I find this too risky.	4.25	4	2.02	0.456	0.675
R3) If I think an investment will be profitable; I am prepared to borrow money to make this investment.**[R]**	5.70	6	1.56	0.277	0.526
R4) I want to be certain that my investments are safe.	5.47	6	1.27	0.360	0.600
R5) I get more and more convinced that I should take greater financial risks to improve my financial position. **[R]**	5.07	5	1.70	0.327	0.572
R6) I am prepared to take the risk to lose money, when there is also a chance to gain money. **[R]**	5.25	6	1.55	0.608	0.779

Table 4
Heterogeneity in individuals' risk aversion.

We present OLS regression results from 2,956 observations from 1,587 individuals. The dependent variable is a continuous risk aversion factor variable. The standard errors are clustered by each individual and robust to heteroskedasticity. *** denotes statistical significance at the 1% level, *** denotes statistical significance at the 5% level, and * denotes statistical significance at the 10% level.

Risk Aversion Factor (decimal)	**(1)**		**(2)**		**(3)**		**(4)**		**(5)**	
	Coef.	**T**	**Coef.**	**T**	**Coef.**	**T**	**Coef.**	**T**	**Coef.**	**T**
Female	0.488***	(8.81)	0.484***	(9.37)	0.494***	(8.87)	0.460***	(8.55)	0.479***	(8.64)
Married	0.013	(0.23)	0.029	(0.52)	0.013	(0.23)	0.005	(0.08)	0.016	(0.28)
36≤ Age ≤50	0.085	(1.25)	0.085	(1.25)			0.103	(1.52)	0.068	(1.00)
51≤ Age ≤65	0.286***	(3.89)	0.329***	(4.57)			0.310***	(4.32)	0.261***	(3.59)
65<Age	0.321***	(3.08)	0.535***	(6.69)			0.349***	(3.39)	0.298***	(2.87)
Education *(High)*	-0.090*	(-1.79)	-0.090*	(-1.80)	-0.123***	(-2.50)	-0.086*	(-1.72)	-0.105**	(-2.10)
Self-employed	-0.233**	(-2.28)			-0.243**	(-2.42)	-0.235**	(-2.31)	-0.284***	(-2.81)
Retired	0.243***	(2.72)			0.399***	(6.31)	0.242***	(2.70)	0.238***	(2.65)
Unemployed	0.111	(1.36)			0.170**	(2.15)	0.102	(1.24)	0.106	(1.30)
Other occupations	-0.067	(-0.69)			0.036	(0.38)	-0.069	(-0.71)	-0.058	(-0.59)
House owners	-0.070	(-1.11)	-0.065	(-1.02)	-0.091	(-1.43)	-0.013	(-0.22)	-0.037	(-0.58)
Financial assets *(Q_2)*	-0.034	(-0.56)	-0.035	(-0.58)	-0.019	(-0.32)	-0.001	(-0.01)		
Financial assets *(Q_3)*	-0.117*	(-1.72)	-0.127*	(-1.87)	-0.086	(-1.28)	-0.054	(-0.87)		
Financial assets *(Q_4)*	-0.280***	(-3.53)	-0.293***	(-3.73)	-0.249***	(-3.14)	-0.204***	(-2.84)		
Net worth *(Q_2)*	0.099	(1.49)	0.090	(1.35)	0.106	(1.59)			0.018	(0.29)
Net worth *(Q_3)*	0.158**	(2.06)	0.152**	(1.96)	0.207***	(2.71)			0.038	(0.52)
Net worth *(Q_4)*	0.158*	(1.82)	0.162*	(1.85)	0.239***	(2.77)			-0.028	(-0.36)
Year 2005	0.038	(1.24)	0.039	(1.24)	0.043	(1.37)	0.039	(1.27)	0.038	(1.24)
Year 2006	-0.011	(-0.33)	-0.010	(-0.28)	0.002	(0.06)	-0.013	(-0.38)	-0.010	(-0.31)
Constant	-0.332***	(-3.69)	-0.342***	(-3.82)	-0.225***	(-2.70)	-0.317***	(-3.59)	-0.339***	(-3.85)
F-statistic	10.42***		11.28***		11.48***		11.79***		11.30***	
R-squared	0.099		0.091		0.089		0.097		0.092	

Table 5

Heterogeneity in stock market returns expectations.

We present OLS regression results from 2956 observations from 1587 individuals. The dependent variable is stock market return expectations. The standard errors are clustered by each individual and robust to heteroskedasticity. *** denotes statistical significance at the 1% level, *** denotes statistical significance at the 5% level, and * denotes statistical significance at the 10% level.

Stock Market Expectations (%)	**(1)**		**(2)**		**(3)**		**(4)**		**(5)**	
	Coef.	**T**	**Coef.**	**T**	**Coef.**	**T**	**Coef.**	**T**	**Coef.**	**T**
Risk Aversion (1= High)	-0.845***	(-2.90)	-0.852***	(-2.96)	-0.875***	(-3.02)	-0.833***	(-2.85)	-0.863***	(-2.97)
Female	-1.458***	(-4.04)	-1.401***	(-4.26)	-1.481***	(-4.07)	-1.582***	(-4.70)	-1.431***	(-3.98)
Married	0.188	(0.52)	0.225	(0.64)	0.217	(0.60)	0.142	(0.39)	0.183	(0.50)
36≤ Age ≤50	-0.025	(-0.05)	-0.045	(-0.09)			0.053	(0.11)	0.026	(0.05)
51≤ Age ≤65	-0.510	(-1.07)	-0.590	(-1.26)			-0.417	(-0.90)	-0.440	(-0.93)
65<Age	-1.077*	(-1.74)	-1.190**	(-2.34)			-0.975	(-1.61)	-1.009*	(-1.64)
Education *(1= High)*	0.522*	(1.69)	0.516*	(1.71)	0.588**	(1.95)	0.533*	(1.74)	0.548*	(1.76)
Self-employed	0.751	(0.93)			0.745	(0.92)	0.752	(0.93)	0.861	(1.07)
Retired	-0.067	(-0.14)			-0.739***	(-2.19)	-0.077	(-0.17)	-0.061	(-0.13)
Unemployed	0.269	(0.46)			0.074	(0.13)	0.223	(0.38)	0.286	(0.49)
Other occupations	-0.425	(-0.65)			-0.679	(-1.06)	-0.425	(-0.65)	-0.441	(-0.69)
House owners	0.369	(0.87)	0.373	(0.88)	0.425	(1.00)	0.630	(1.58)	0.291	(0.68)
Financial assets *(Q_2)*	-0.004	(-0.01)	0.038	(0.10)	-0.042	(-0.10)	0.193	(0.48)		
Financial assets *(Q_3)*	0.373	(0.83)	0.438	(0.99)	0.310	(0.69)	0.732*	(1.83)		
Financial assets *(Q_4)*	0.596	(1.24)	0.687	(1.45)	0.533	(1.12)	0.974**	(2.31)		
Net worth *(Q_2)*	0.633	(1.40)	0.626	(1.38)	0.627	(1.38)			0.853**	(2.07)
Net worth *(Q_3)*	0.839*	(1.65)	0.815	(1.60)	0.756	(1.50)			1.130**	(2.42)
Net worth *(Q_4)*	0.748	(1.30)	0.726	(1.26)	0.578	(1.02)			1.181**	(2.40)
Knowledge Level *(More or Less)*	1.250***	(3.03)	1.240***	(2.99)	1.268***	(3.06)	1.270***	(3.08)	1.270***	(3.05)
Knowledge Level *(High)*	1.731***	(3.57)	1.745***	(3.61)	1.773***	(3.65)	1.739***	(3.59)	1.777***	(3.67)
Advice *(Media)*	0.755**	(2.07)	0.738**	(2.02)	0.655*	(1.82)	0.777**	(2.13)	0.756**	(2.07)
Advice *(Professional Advisor)*	0.975***	(2.55)	0.989***	(2.59)	0.923**	(2.43)	1.001***	(2.63)	0.987***	(2.58)
Advice *(Others)*	1.180*	(1.85)	1.165*	(1.83)	1.076*	(1.72)	1.155*	(1.81)	1.166*	(1.82)
Year 2005	-1.355***	(-5.20)	-1.355***	-(5.20)	-1.371***	(-5.28)	-1.351***	(-5.19)	-1.355***	(-5.20)
Year 2006	0.159	(0.56)	0.164	(0.58)	0.133	(0.47)	0.154	(0.54)	0.157	(0.56)
Constant	1.715***	(2.21)	1.715**	(2.26)	1.609**	(2.20)	1.815**	(2.38)	1.686**	(2.26)
F-statistic	8.55***		9.34***		9.50***		9.99***		9.35***	
R-squared	0.066		0.065		0.065		0.065		0.064	

Table 6

Stock market participation and portfolio allocation decisions.

We present the second-stages of IV estimates with GMM estimators. In GMM (1), the dependent variable takes a value of 1 if individuals own any risky financial assets; otherwise, it takes a value of zero. In GMM (2), the dependent variable is investors' share of risky financial assets relative to their total financial assets. In the report of P-value endogeneity tests, Ex stands for stock market expectations, and Ex'RA stands for the interactions between stock market expectations and risk aversion. Our standard errors are clustered by individuals and robust to heteroskedasticity. *** denotes statistical significance at the 1% level, *** denotes statistical significance at the 5% level, and * denotes statistical significance at the 10% level.

	GMM (1)		**GMM (2)**	
	Stock Market Participation		**Risky Financial Assets**	
	Coef.	**Z**	**Coef.**	**Z**
Stock Market Expectation	0.043***	(3.76)	0.020**	(2.34)
Risk Aversion (1 = High)	-0.107**	(-2.19)	-0.036	(-0.59)
Risk Aversion X Expectation	-0.022*	(-1.67)	0.006	(0.48)
Female	0.049*	(1.77)	0.005	(0.16)
Married	-0.005	(-0.20)	-0.093***	(-3.01)
36≤ Age ≤50	0.097***	(3.02)	0.053	(1.14)
51≤ Age ≤65	0.032	(0.96)	0.008	(0.16)
65<Age	0.092*	(1.88)	0.145**	(2.37)
High level education	0.066***	(2.67)	0.021	(0.81)
Self-employed	0.199***	(3.32)	0.362***	(8.10)
Retired	-0.006	(-0.16)	0.016	(0.38)
Unemployed	0.027	(0.77)	0.100*	(1.91)
Other occupations	0.101**	(2.40)	-0.011	(-0.22)
House owners	-0.055*	(-1.78)	0.085**	(2.19)
Financial assets *(Q_2)*	0.142***	(5.45)	0.004	(0.06)
Financial assets *(Q_3)*	0.316***	(9.56)	-0.004	(-0.05)
Financial assets *(Q_4)*	0.548***	(15.13)	-0.010	(-0.15)
Net worth *(Q_2)*	-0.014	(-0.42)	-0.138***	(-2.28)
Net worth *(Q_3)*	-0.001	(-0.02)	-0.172***	(-2.60)
Net worth *(Q_4)*	-0.027	(-0.63)	-0.179***	(-2.59)
Knowledge Level *(More or Less)*	0.013	(0.45)	-0.067*	(-1.63)
Knowledge Level *(High)*	0.068*	(1.83)	-0.086**	(-1.94)
Advice *(Media)*	0.037	(1.43)	-0.060	(-1.48)
Advice *(Professional Advisor)*	0.040	(1.40)	-0.008	(-0.20)
Advice *(Others)*	0.005	(0.13)	0.026	(-0.43)
Year 2005	0.066***	(3.45)	0.035	(1.42)
Year 2006	0.020	(1.16)	0.020	(1.02)
Constant	-0.120**	(-2.17)	0.419***	(4.31)
R-squared		0.4920		0.6405
N of Observations		2640		911
N of Individuals		1426		485
Underidentification test: P-value of Kleibergen-Paaprk LM statistics, Chi-sq (3)		0.000		0.000
Endogeneity test: P-value on Ex, Chi-sq (1)		0.00		0.00
Endogeneity test: P-value on Ex'RA, Chi-sq (1)		0.09		0.09
Exogeneity test: P-value of C statistic on Risk Aversion		0.19		0.31
Exogeneity test: P-value of C statistic on Future Expectations Instruments		0.37		0.66
Exogeneity test: P-value of C statistic on Horizon Instruments		0.21		0.37

Table 7
Robustness checks.

We extend the GMM (1) models with an additional control variable for the health condition. The dependent variable takes value of 1 if individuals own any risky financial assets; otherwise, it takes value of zero. For simplicity, we only report results of the second-stage from the IV estimates and only those coefficients which are of interest. "Ex" stands for stock market expectations, and "Ex'RA" stands for the interactions between stock market expectations and risk aversion. F-statistics are cluster robust, and our standard errors are clustered by individuals and robust to heteroskedasticity. *** denotes statistical significance at the 1% level, *** denotes statistical significance at the 5% level, and * denotes statistical significance at the 10% level.

Stock market participation	**GMM(1)**	
	Coef.	**Z**
Stock Market Expectation	0.040***	(3.59)
Risk Aversion	-0.111**	(-2.37)
Risk Aversion X Expectation	-0.023*	(-1.86)
Health condition now compared to last year		
About the same	-0.044	(0.11)
Worse	-0.034	(0.33)
R-squared		0.5149
N of Observations		2511
N of Individuals		1361
Underidentification test: P-value of Kleibergen-Paaprk LM statistics, Chi-sq (3)		0.000
Angrist-Pischke F-statistics of excluded instruments		
Ex (P-value)		6.87 (0.000)
Ex'RA (P-value)		5.00 (0.000)

Appendix A.

Survey questions, descriptions of other behavioural factors

This appendix presents the Dutch National Bank Household Survey questions and mean values over 2004-2006. These questions are included in our study as control variables, and instruments in the IV estimates.

Survey Questions	Definition	2004	2005	2006	Total	*N*
Control Variables						
Financial Knowledge Level						
How knowledgeable do you consider	Not knowledgeable	0.140	0.142	0.131	0.138	2956
yourself with respect to financial	More or less	0.584	0.591	0.590	0.588	
matters?	Knowledgeable	0.276	0.267	0.280	0.274	
Source of Financial Advice						
What is your most important source	Parents, Friends, etc.	0.190	0.202	0.212	0.201	2956
of advice when you have to make	The Media	0.459	0.454	0.467	0.459	
important financial decisions for the	Professional Advisers	0.282	0.276	0.250	0.271	
household?	Others	0.069	0.068	0.072	0.069	
Instruments						
Expected Financial Situation						
Do you expect your financial	Improve	0.234	0.205	0.238	0.225	2939
situation to improve or	Stay the same	0.559	0.528	0.519	0.537	
deteriorate in the coming year?	Deteriorate	0.207	0.267	0.243	0.239	
Investment Horizon						
People use different time-horizons when they decide about what	Next couple of months	0.299	0.359	0.314	0.324	2655
part of the income to spend, and what	Next year	0.235	0.194	0.221	0.217	
part to save. Which of the time-horizons mentioned below is in your	Next couple of years	0.316	0.292	0.321	0.309	
household MOST important with	More than five years	0.150	0.155	0.144	0.150	
regard to planning expenditures and savings?						
Additional Control Variable						
Expected Health Condition						
Compared to one year ago, would you say your health is better	Better	0.127	0.113	0.108	0.117	2737
now or worse?	About the same	0.757	0.741	0.753	0.750	
	Worse	0.116	0.146	0.139	0.133	