Subjective Stock Market Expectations, Information and Stock Market Participation: Evidence from France*

Luc Arrondel
Banque de France-CNRS-PSE

Hector Calvo-Pardo
University of Southampton

Derya Tas
University of Southampton

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Abstract

We elicit probabilistically households' subjective beliefs regarding the 5-year-ahead evolution of the Stock Market, for a representative sample of 3,826 French Households (TNS 2007). The extent to which subjective beliefs explain the decision to participate is empirically assessed, *conditioning* on households' individual information sets. A quantitative measure of information at the individual level is obtained eliciting probabilistically past Stock Market performance over a 5-year-time window. We find that the subjective *conditional* expectation of a positive return (i) explains their decision to invest, and (ii) is hump-shaped in age.

Keywords: Subjective Expectations, Information, Stock Market Participation, Household Finance
JEL Codes: D12, D8, G11

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1 Introduction

Nonparticipation in risky asset markets had recently acquired the status of 'financial mistake', with potentially large consequences for equilibrium asset prices and the equity premium.[1] Since the educated and the wealthier are more likely to participate, information and fixed participation/transaction costs, respectively, have been advanced as the main factors accounting for nonparticipation (Guiso et al., 2002). But several questions remain, like the nonparticipation of the wealthiest, or the precise nature of information costs.

Rather than embracing non standard behaviour, here we argue that households may face information constraints that the standard models do not capture, and attempt to measure them. A common assumption in the literature is that households hold rational expectations regarding the evolution of the stock market. Since the stock market is a public non-manipulable event, under rational expectations households hold a common, unbiased, statistically correct view of the future value of the index. As such, differences in household financial choices cannot be explained by differences in what they expect, only by differences in either what they want (preferences) or in what they have (endowments) when participation is costly. Against this received wisdom, a yet incipient strand of new research, reviewed in Hurd (2009), uncovers that households' expectations regarding the future evolution of the stock market are: (i) for the majority, no better than a 50-50 chance that the stock market index will go up in the year ahead, albeit (ii) extremely heterogeneous (Dominitz and Manski, 2007 and 2011); (iii) able to explain differences in financial choices both at a point in time, and through the life-cycle (Dominitz and Manski, 2007; Hurd, van Rooij and Winter, 2011), and (iv) able to identify households' implicit risk preferences, when combined with data on financial choices (Kézdi and Willis, 2009).

These novel contributions rest on the methodological corner stone put by Dominitz and Manski (1997) and on Manski's (2004) influential review article. The latter advocates for treating expectations as primitives of the model, instead of outcomes of a rational expectations equilibrium process. In the former, probabilistic elicitation is undertaken to quantitatively measure individual (income) expectations from survey data. In line with this new literature, here we apply Dominitz and Manski's (1997) insights to retrieve

[1] The more so, the larger the fraction of the wealthiest risk-tolerant households that does not participate, since the aggregate demand for risky assets disproportionately depends on them. And even amongst the wealthiest, nonparticipation remains strikingly high. See Campbell (2006) and the references therein.

a quantitative measure of households' expectations regarding the future evolution of the stock market, and examine if similarly constructed measures of expectations, explain stock market participation.

We contribute to this literature in three main directions: (i) we elicit probability densities instead of probability distributions and over a longer forecasting horizon, (ii) we exploit survey data from a representative sample of the French population by both age and wealth, and (iii) we elicit probabilistically households' information sets. Probability densities are elicited on seven points of the outcome space, following the methodology of the Survey on Household Income and Wealth (SHIW), conducted by the Bank of Italy. By extending the forecasting horizon to five years, we intend to untie expectational answers from the bussiness-cycle conditions prevailing at the time of the survey (March 2007) to better capture (i) the historic average upward trend of the stock market index, and (ii) the relevant forecasting horizon with which households take their financial decisions. Survey data from a representative sample by age allows us to understand how do expectations vary with age, and its implications for the age-portfolio profile at the extensive margin. Finally, probabilistic elicitation of recent past stock market performance provides a quantitative measure of households' degree of awareness regarding their investment opportunity set. Without it, households who do not invest because they expect the stock market to burst over the given forecasting horizon are indistinguishable from those who do not invest because they are unaware of the investment opportunities available in the stock market.

To that end, we exploited data from a new wave of the Taylor-Nelson Sofres French survey (TNS 2007), which contains information on attitudes, preferences, expectations and socio-economic and demographic characteristics for a representative sample of 3,826 households. We find (i) less 50-50 percent responses to probability questions, possibly conveying absolute uncertainty, at the expense of (ii) more answers conveying absolute certainty, i.e. 0 ('no chance') and 100 ('for sure') type of answers; (iii) five-year ahead probabilistic stock market forecasts appear hump-shaped in age and increasing in wealth, and (iv) increase with the probability of holding stocks and educational attainment. Finally, (iv) our individual measure of information increases with age and wealth, access to the internet and with the past frequency of stock market operations.

The rest of the paper is organized as follows: in section 2 we describe the methodology used to elicit expectations and individual information sets, and construct measures of expectations similar to Dominitz and Manski (2007) to assess the quality of our data against the 2004 wave of the Health

and Retirement Study (HRS 2004), which contains a much larger sample of households. In section 3 we describe the TNS 2007 data set and provide descriptive statistics. Section 4 reports the main empirical results on stock market participation, and section 5 concludes.

2 Measuring Expectations and Information

2.1 Survey Design

In surveys, respondents are asked to to state their perception of a future event in order to understand if it affects their current behaviour. The recent literature on measuring expectations privileges the use of probability questions rather than eliciting point expectations or the traditional qualitative approach of attitudinal research (Manski, 2004). Answers to such questions are used to understand if expectations and outcomes are related, and to evaluate if individual behaviour changes in response to changes in expectations. Dominitz and Manski (2007) elicit individuals' expectations of stock market returns inquiring about how 'well' the respondent thinks the economy will do in the year ahead (Positive Nominal Return, PNR). They exploit data for a representative sample of the elderly from the 2004 wave of the U.S. Health and Retirement Study (HRS).

To validate our dataset, we build upon their work using a similar methodology, and extend it along different dimensions. First, we extend the forecasting horizon from 1 year to 5 years ahead, in order to reduce the sensibility of answers to (i) business-cycle conditions prevailing at the time of the interview, and to (ii) inertia in portfolio management. The latter is important since it remains an open question with which horizon households invest in the stock market. Second, we elicit probability density functions (pdfs.) for seven points in the outcome space (Guiso et al., 1996), instead of just two points of the cumulative distribution functions (cdfs.), which should provide more precise individual estimates of the relevant moments. Third, we exploit data from a representative sample by age, to examine the relationship between age-portfolio profiles and subjective expectations. Finally and most importantly, we advance a novel measure of individual information sets based on probabilistic elicitation of past stock market performance (past Positive Nominal Return, pPNR), to capture: (i) differences in information across households, and (ii) the relationship between information and expectations.

The new wave of the Taylor-Nelson Sofres French survey (TNS 2007) was designed by researchers at the Paris School of Economics (PSE), and

administered by Taylor-Nelson Sofres, a professional agency paid with research funds from the Agence Nationale pour la Recherche (ANR). The first wave, carried in 2002, had no questions related to stock market expectations. The 2007 wave contains very detailed information on attitudes, preferences and expectations, in addition to wealth, income and socio-economic and demographic characteristics for a representative sample of French households. A questionnaire was sent to a representative sample of 4,000 individuals, corresponding to an equivalent number of households. Respondents had to fill the questionnaire, and return it by the post in exchange of around €25 in coupon-tickets (*bons-d'achat*).[2] 3,826 respondents sent their questionnaires back, representing a 97% response rate.

The survey was conducted in March 2007. Figure 1 below shows that after a drop of nearly 60% in the French stock market Index (CAC-40) caused by the 'dot-com crash' of 2001, by the time the survey was conducted, the stock market index had been steadily recovering since the mid 2002. In March 2007 the index was still below its 'dot-com' peak. Hence, it is likely that respondents are particularly aware of the stock market evolution regarding the past, and provide very heterogeneous and uncertain answers regarding the stock market prospects for the five years to come, given the recent experience of a bust and a boom.

The density of nominal yearly (and 5-year rolling) log returns on the CAC-40 computed from monthly data between July 1987 and July 2011 is depicted in Figure 2, panel (a) (panel (b)). The distribution has moments $\mu = 0.023$ ($\mu(5) = 0.108$) and $\sigma = 0.10$ ($\sigma(5) = 0.19$). The densities depicted in Figure 2 can be thought as representing the subjective beliefs of those respondents who form rational expectations, i.e. their beliefs are based on the history of observed stock market index closing values:

2.2 Expectations

To measure expectations, we elicited households' subjective beliefs regarding the likely evolution of the stock market index five years ahead in time, I_{t+5}, relative to March 2007, I_t, from the following questions (translated wording):

[2] Within it, the survey contains a small sample of 798 households has a panel dimension, linking to the previous TNS-2002 survey (4,000 35-55 year-old households) and of 2,234 households linking to the new TNS-2009 (4,000 households). As well, a complementary experimental module which could *voluntarily* be filled on-line (400 individuals corresponding to 400 households) in exchange of a variable remuneration (€5,000 shared in prizes in the form of lotteries) was introduced. Neither is exploited here.

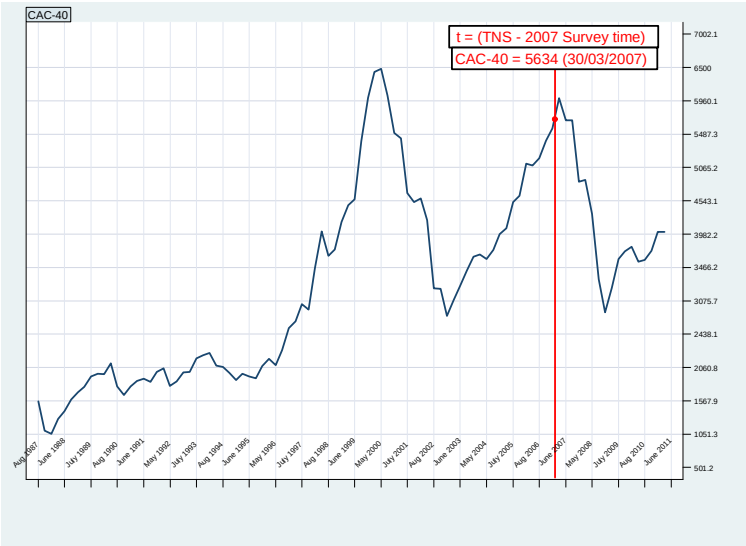
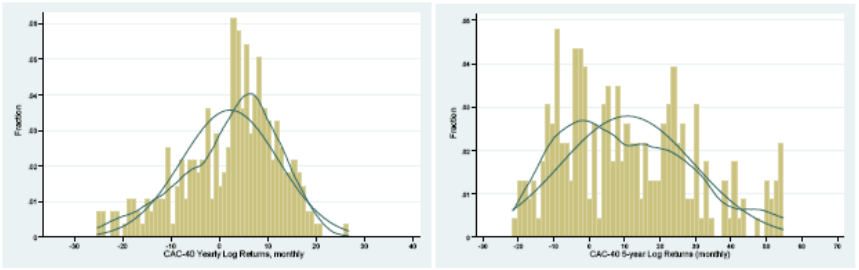


Figure 1: French Stock Market Index CAC-40 between July 1987 and July 2011. The survey was conducted in March 2007. Source: Author's own calculations from MSN Money hsitorical data.



Panel (a): 1-year log-returns. Panel (b): 5-year log-returns.

Figure 2: Histogram of CAC-40 index log-returns, computed at 1-year (panel a) and 5-year (panel b) rolling window frequencies. Source: Author's own calculations using monthly data between July 1987 and July 2011, available online from MSN Money.

C6. 'Five years from now, do you think that the stock market... -For each category write down the likelihood of occurrence assigning a value between 0 and 100. The sum of all your answers must be equal to 100-:

... will have increased by more than 25%

... will have increased by 10 to 25%

... will have increased by less than 10%

... will be the same

... will have decreased by less than 10%

... will have decreased by 10 to 25%

... will have decreased by more than 25%

C7b. 'In your opinion, if you expect the stock market to increase within the next 5 years, which would be the highest possible increase (as a percentage)?'

C8b. 'In your opinion, if you expect the stock market to decrease within the next 5 years, which would be the lowest possible decrease (as a percentage)?'

Question C6 inquires household i about the subjective relative likelihood of occurrence, $p^i_{t+1,k}$, of each of the seven alternative scenarios, $k = 1, ..., 7$. Each scenario represents a possible outcome range for the percentage change in the index between t and $t+5$, $R_{t+1}(5) \equiv \frac{I_{t+5}}{I_t} - 1$.[3] Questions C7b and C8b provide subjective upper and lower bounds for the percentage change, $R^i_{\max}$ and $R^i_{\min}$ respectively. The corresponding outcome ranges are:

$$R_{t+1} \in \left\{ \underbrace{[R^i_{\max}, 0.25)}_{k=1}, \underbrace{[0.25, 0.10]}_{k=2}, \underbrace{(0.10, 0)}_{k=3}, \underbrace{\{0\}}_{k=4}, \underbrace{(0, -0.10)}_{k=5}, \underbrace{[-0.10, -0.25]}_{k=6}, \underbrace{(-0.25, -R^i_{\min}]}_{k=7}, \right\}$$

and households' subjective likelihoods are accordingly:

$$p^i_{t+1,k} \equiv \Pr{}^i \left[R_{t+1} \in k \right] = \Pr{}^i \left[\frac{I_{t+5}}{I_t} - 1 \in k \right], \forall i$$

[3] We follow the standard convention in finance for long-horizon returns, and let $1 + R_{t+1}(s)$ denote the stock market index gross return over s *periods ahead* (hence the subindex $t+1$), which is equal to the product of the s single-period (or yearly) returns:

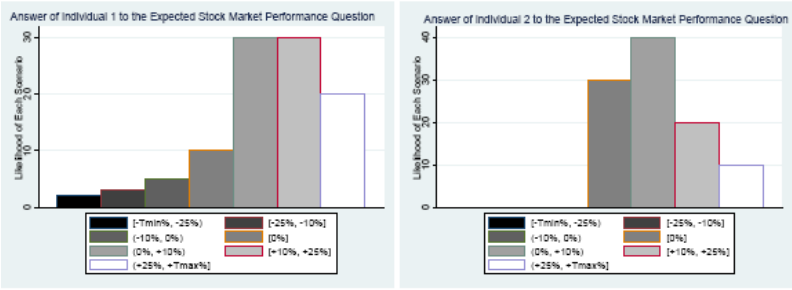
$$1 + R_{t+1}(s) = \prod_{f=0}^{s-1} (1 + R_{t+1+f}) = \prod_{f=0}^{s-1} \left(\frac{I_{t+1+f}}{I_{t+f}} \right)$$

Similarly, we let $1 + R_t(s)$ denote the stock market index gross return *over the most recent* s periods from date $t-s$ to date t (hence the subindex t):

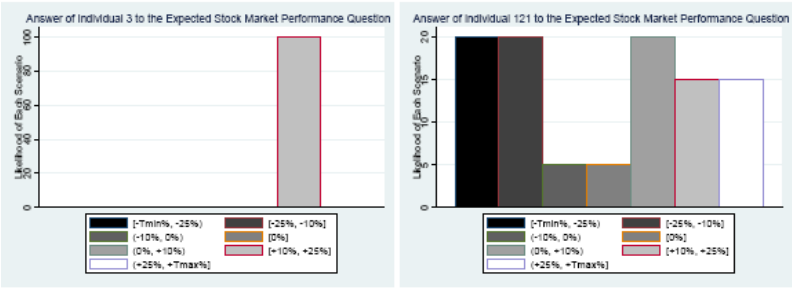
$$1 + R_t(s) = \prod_{b=0}^{s-1} (1 + R_{t-b}) = \prod_{b=0}^{s-1} \left(\frac{I_{t-b}}{I_{t-1-b}} \right)$$

See Campbell *et al.* (1997) for details.

The four panels ((a) - (d)) in Figure 3 below illustrate how do elicited probability density functions look like for a small subset of individuals:



Panel (a): Individual 1. Panel (b): Individual 2.



Panel (c): Individual 3. Panel (d): Individual 121.

Figure 3: Individual histograms of respondents' answers to survey question qc6 (PNR). Source: TNS 2007.

Out of the 3,826 sample respondents, around 63% (2,406) meaningfully answered to the expectations question. 328 cases are excluded as the sum of their answers do not round up to 100 [95,105]. [4] Figure 4 below depicts the histogram, which averages the individual probability density functions of those who answered. On average, households appear more pessimistic and uncertain than the historical record would predict (Figure 2b).

To validate our survey data, and for comparison purposes, we construct

[4] Missing and erroneous answers are regressed against stockholding status, and a set of covariates (gender, marital status, education, risk preference) using a probit (Table 11 in the appendix). They appear strongly related to stockholding, just as Kézdi and Willis (2009) find for the HRS 2002 wave.

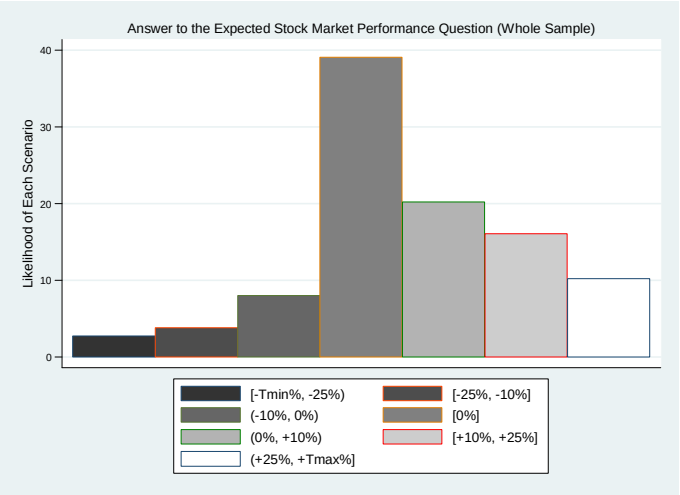


Figure 4: Histogram of average individual answers to the likelihood of the different scenarios regarding 5-year ahead stock market performance. Source: TNS 2007 survey.

from respondents' answers Dominitz and Manski's (1997) Positive Nominal Return (PNR) variable which captures the 5-year ahead percentage chance of a positive nominal return [5]:

$$\forall i: \quad PNR^i \equiv \Pr{}^i \left[R_{t+1}(5) > 0\right] = \Pr{}^i \left[\frac{I_{t+5}}{I_t} - 1 \in \cup_{k=1}^{3} \{k\}\right] = p^i_{t+1,1} + p^i_{t+1,2} + p^i_{t+1,3}$$

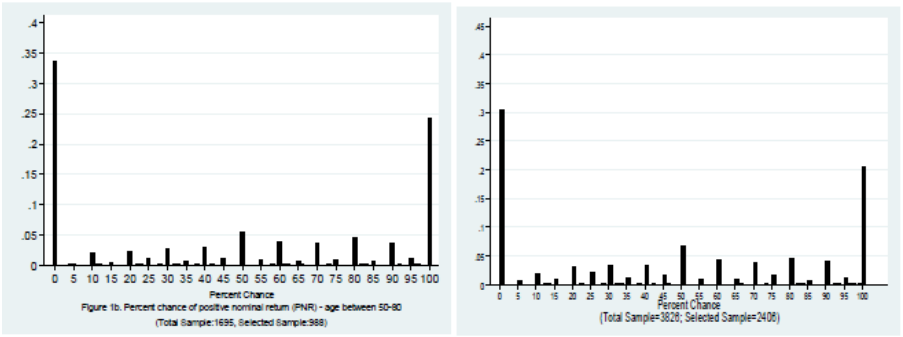
Figure 5 below, depicts the frequency distribution of responses, for ages in the 50-80 age bracket (panel (a)) and for all ages (panel (b)). Despite of the age differences, the similarities with both the HRS and the De Nederlandsche Bank Household Survey (DHS) exploited by Hurd et al. (2011) are striking: there is similar bunching of responses around round numeric

[5] In Dominitz and Manski (2007), 15,166 HRS respondents, aged 50 to 80 in 2004, were asked:

Positive Nominal Return (PNR): We are interested in how well you think the economy will do in the next year. By next year at this time, what is the percent chance that mutual fund shares invested in blue chip stocks like those in the Dow Jones Industrial Average will be worth more than they are today?

$$\forall i: \quad PNR^i_{DM} \equiv \Pr{}^i \left[\frac{I_{t+1}}{I_t} - 1 \in \cup_{k=1}^{3} \{k\}\right]$$

probability answers. For all ages, the mean response is 46.5%, while for the elderly, it is 47.1%. This compares with a 49% mean response, for the 50-80 HRS 2004 respondents, and with a 41.6% (50.1%) for a representative sample by age of the DHS 2004 (2006) respondents. However, bunching is much stronger in the {0,100} answers, than in the 50 percent chance response, indicating less epistemic uncertainty according to Bruine de Bruin *et al.* (2000). For all ages, 31% (21%) gave answers consistent with absolute certainty that the index would go down (up) over the coming 5 years. Evidence from the financial literature on long horizon returns suggests that the longer time horizon given to evaluate stock market performance might explain the differences, because of mean-reversion (Campbell *et al.*, 1997). In the next subsection we further examine this question.



Panel (a): Ages 50-80. Panel (b): All ages.

Figure 5: PNR by age groups, frequency distribution. Source: TNS 2007.

Table 1 reports the distribution of responses and the response rate conditioning on age, gender, and marital and stockholding status. Consistent with the findings reported in Dominitz and Manski (2007), the mean percentage chance of a positive nominal return is higher for respondents who are married. The differential is 1.4 percentage points for men (50.1% versus 48.7%), while for females, it is only 1.1 percentage points (43.7% versus 42.6%). Figure 6 shows that also in France, males are more optimistic than females. Even when conditioning on marital and stockholding status and for all age brackets, do men give more optimistic reports than do women, and are 6-7 percentage points more likely to give a response.

In line with the HRS 2002 findings by Kézdi and Willis (2009), expectations (noisily) increase with the respondent's education and households' total wealth. Figure 7 (8) displays kernel-smoothed estimates of the mean

Table 1: Expectations of positive nominal return (PNR), by attribute; TNS 2007

	Male							Female						
Attribute to PNR	Number of respondents to PNR	Mean	St. Dev.	Quantile 0.25	Quantile 0.50	Quantile 0.75	Rate of response to PNR	Number of respondents to PNR	Mean	St. Dev.	Quantile 0.25	Quantile 0.50	Quantile 0.75	Rate of response to PNR
All Respondents	1,169	49.7	40.2	0	50	95	0.77	1,205	43.2	39.1	0	40	80	0.66
Married or living with a partner														
No	322	48.7	38.2	0	50	90	0.76	471	42.6	38.9	0	40	80	0.60
Yes	847	50.1	40.9	0	50	97	0.78	734	43.7	39.2	0	40	83	0.72
Age														
Under 30	150	42.6	36.4	0	38	70	0.71	193	40.1	37.1	0	35	75	0.68
30-39	242	47.2	38.3	0	50	80	0.81	280	45.4	38.5	0	45	80	0.75
40-49	252	53.7	40.2	0	60	100	0.81	236	43.5	39.0	0	40	82	0.71
50-59	240	51.4	41.1	0	58	100	0.81	243	41.5	39.2	0	40	80	0.68
60-69	166	50.1	42.8	0	55	100	0.77	145	45.0	40.1	0	45	90	0.64
70 and over	119	51.6	42.3	0	55	100	0.68	108	44.4	43.1	0	40	98	0.46
Holds stocks or mutual funds														
No	709	44.0	40.2	0	40	90	0.71	777	39.2	38.8	0	30	75	0.61
Yes	460	58.6	38.6	20	70	100	0.90	428	50.5	38.6	5	50	90	0.81

Note: Sample restricted to those with own or spouse/partner report of whether or not household holds 'stocks or stock mutual funds'.

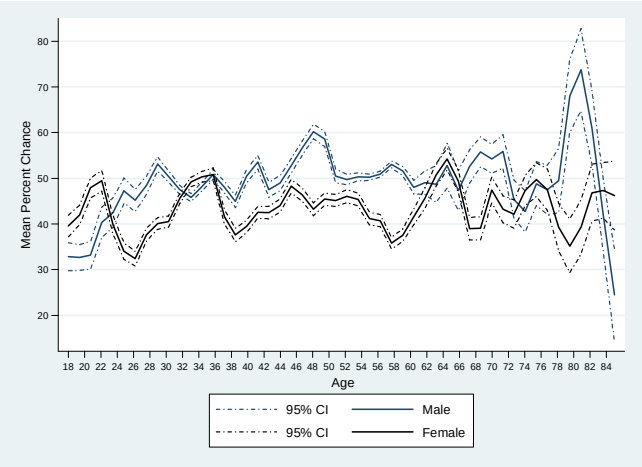


Figure 6: Mean PNR by age and gender. Source: TNS 2007.

percentage chance of a positive nominal return conditional on total wealth (educational attainement). The solid curve depicts point estimates and the grey area around it represents (bootstrap) 95% confidence intervals. The median of total wealth is €118,792, and the 90th percentile €413,476. We excluded 42 households with wealth above €800,000. The richest households (with wealth above the 90th percentile), appear more optimistic regarding the future evolution of the stock market. An increase in wealth from the 10th to the 90th percentile, is estimated to increase the mean percentage chance of a positive nominal return by about 2 to 3 percentage points.

Figure 8 below compares by age, the mean percentage chance of a positive nominal return of respondents with some college education or more relative to those having at most completed high school. Broadly, the former seem to be slightly more optimistic than the latter, although both tend to become more optimistic regarding the future as they age.

Finally, expectations of a positive nominal return appear roughly hump-shaped in age, as does the response rate to the probabilistic question. In Figure 9, the mean response increases steadily until the mid 30s, only to decline (noisily) from the mid 60s. In between, and although expectations peak at the age of 50, no clear pattern emerges. The mean percentage chance of a positive nominal return is estimated to increase (fall) by about 8 to 12 (5 to 6) percentage points as age increases (decreases) from 20 to 50 (late 60s onwards).

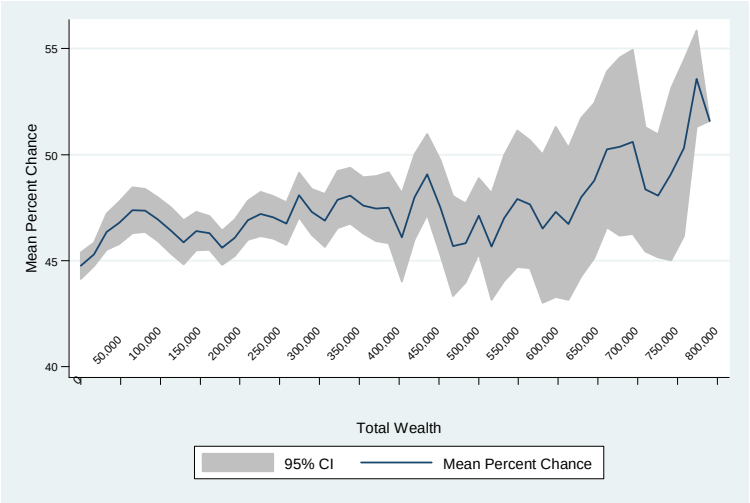


Figure 7: Mean percentage chance of a positive nominal return over the next 5 years (PNR) by total wealth. Source: TNS 2007.

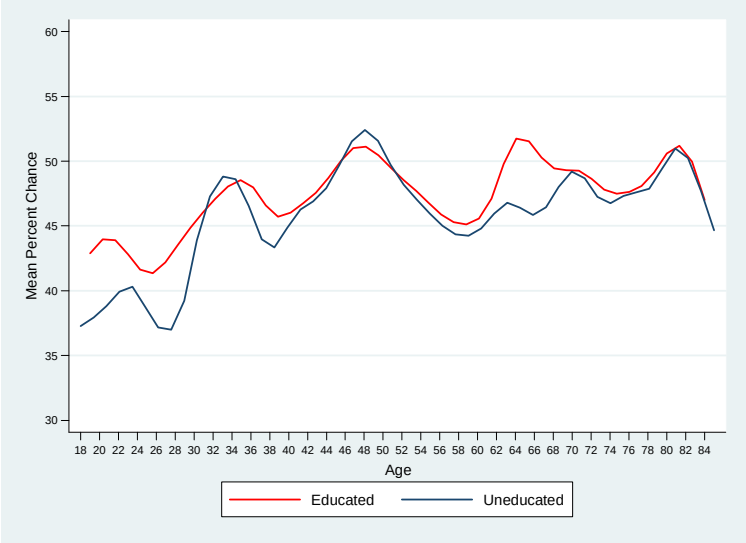


Figure 8: Mean percentage chance of a positive nominal return over the next 5 years (PNR) by educational attainement. Source: TNS 2007.

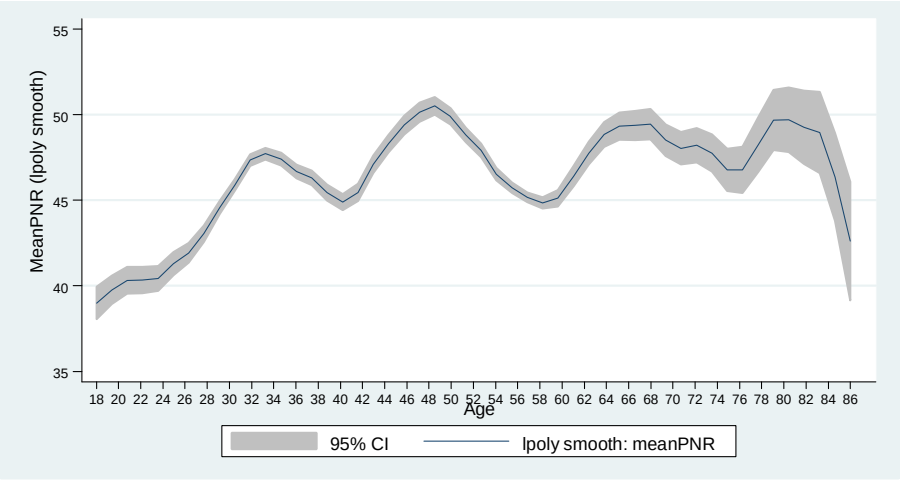


Figure 9: Mean PNR, conditional on age. Source: TNS 2007.

Standard life-cycle portfolio choice models predict that the young should invest heavily in the stock market to take advantage of the equity premium and quickly accumulate wealth. The descriptive evidence reported here suggests that expectations vary systematically with age, and that both the young and the elderly appear particularly pessimistic.

2.3 Measuring Information

Another possibility is that the young are particularly unaware of the investment opportunities offered by the stock market (Hurd, 2009). Recent studies stress the importance of financial literacy (reviewed in Lusardi, 2008) when accounting for stock market participation decisions. Those studies ask general numeracy questions as well as specific questions regarding elementary notions about the working of financial markets. Here, we are more specific and inquire respondents about recent past stock market performance, in line with results in the finance literature (Zhang, 2006).

To obtain a measure of how informed respondents were, we elicited probabilistically households' information sets, to capture: (i) differences in information across households, and (ii) the relationship between information about the recent past, and answers to forward-looking probability questions (Dominitz and Manski, 2011). In addition, we show that conditioning on information reduces the bunching around focal point responses conveying

absolute certainty, i.e. $PNR = \{0, 100\}$.

In the TNS 2007, we inquired respondents about the likely evolution of the stock market index over the *past* five years, I_{t-5}, relative to the time of the interview (March 2007), I_t, as follows (translated wording):

C9. 'Over the past five years, do you think that the stock market... -For each category write down the likelihood of occurrence assigning a value between 0 and 100. The sum of all your answers must be equal to 100-:

... has increased by more than 25%
... has increased by 10 to 25%
... has increased by less than 10%
... has remained the same
... has decreased by less than 10%
... has decreased by 10 to 25%
... has decreased by more than 25%

Question C9 inquires household i about the subjective relative likelihood of occurrence, $p^i_{t,k}$, of each of the seven alternative scenarios, $k = 1, ..., 7$. Each scenario represents a possible outcome range for the percentage change in the index between $t-5$ and t, $R_t(5) \equiv \frac{I_{t-5}}{I_t} - 1$. Since ranges $k = 1$ and $k = 7$ are unbounded, we set $(R_{\max}, R_{\min})$ to match observed values.The outcome ranges for R_t are therefore identical to those of question C6 described above. Accordingly, households' subjective likelihoods are given by:

$$p^i_{t,k} \equiv \Pr{}^i [R_t \in k] = \Pr{}^i \left[\frac{I_{t-5}}{I_t} - 1 \in k \right], \forall i$$

Five years prior to the time when the survey was conducted (March 2002), the stock market index was around half-way down the 'dot-com' bust. But, from the beginning of March 2002 (CAC 40 = 4688.02) until the beginning of March 2007 (CAC 40 = 5634.16), the index had increased an overall 20.2%. Figure 10 below illustrates the wanderings of the CAC-40 index between 1987 and 2011:

The panels (a) - (d) in Figure 11 below, illustrate how do individual information sets look like for the same small subset of individuals whose answers regarding future stock market performance are depicted in Figure 3, panels.(a) - (d). Information regarding past stock market performance is elicited as a probability density function. According to Figure 10, a perfectly informed individual should attribute probability one to the outcome range "...has increased by 10 to 25%" ($k = 2$), higlighted in red below:

Out of the 3,826 sample respondents, around 59% (2,253) provided a meaningful answer to the information question. 322 cases are excluded as the

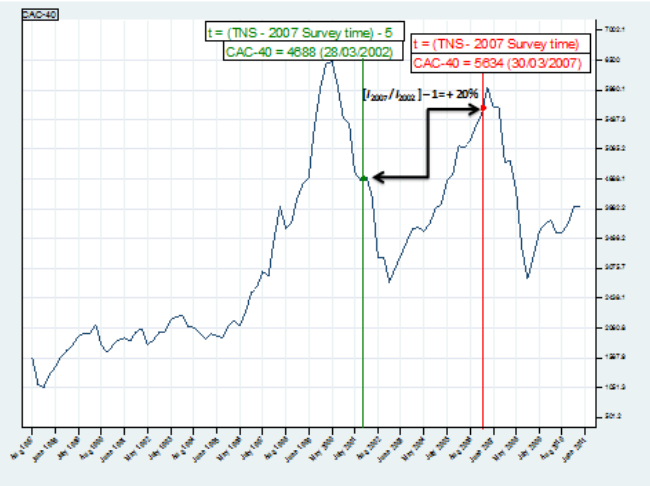


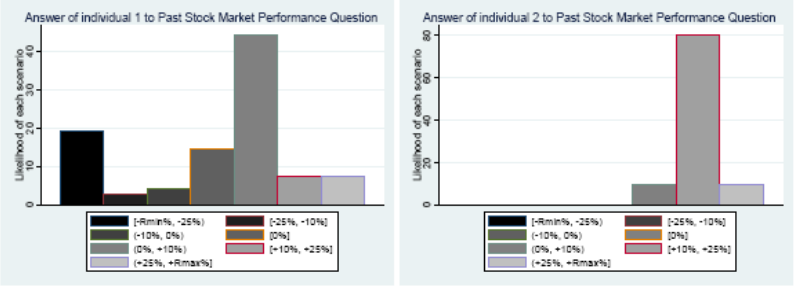
Figure 10: The French Stock Market Index CAC-40 between July 1987 and July 2011. Between March 2002 and March 2007 (5 years prior to the time of the survey) the index had increased by around 20%. Source: Author's calculations from MSN Money monthly data, available online.

sum of their answers do not round up to 100 [95,105]. Figure 12 below depicts histogram of the average of the individual probability density functions.

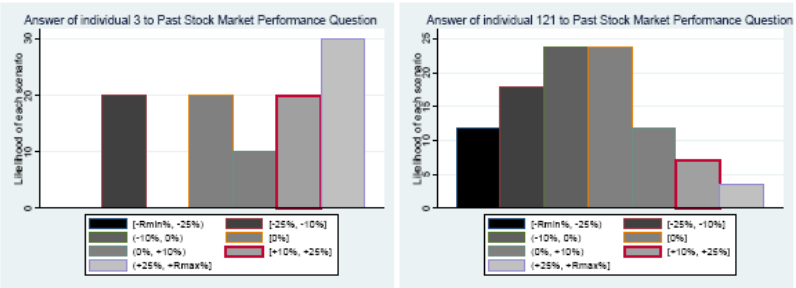
A striking finding is that households are on average also pessimistic regarding how well has the stock market performed over the last five years. Although this might be due to imperfect recall given the unusually long horizon (although respondents could have accessed the internet and report the correct response) it might also be related to the 'dot-com' bust being overweighted on respondents' memory, even if outside the time frame given in the question. Table 2 below reports summary sample statistics for respondents' answers regarding past and future stock market returns, imposing a uniform distribution within the different outcome ranges. Although the big spread around the past sample average returns came as no surprise, it is remarquable that it remains smaller than the spread around the mean future stock market performance:

For consistency, we construct from respondents' answers the past Positive Nominal Return (pPNR) variable which captures the percentage chance of a positive nominal return over the last five years:

$$\forall i: \quad pPNR^i \equiv \Pr{}^i \left[R_t(5) > 0\right] = \Pr{}^i \left[\frac{I_{t-5}}{I_t} - 1 \in \cup_{k=1}^{3} \{k\}\right] = p_{t,1}^i + p_{t,2}^i + p_{t,3}^i$$



Panel (a): Individual 1. Panel (b): Individual 2.



Panel (c): Individual 3. Panel (d): Individual 121.

Figure 11: Individual histograms of responses to the survey question C9 (pPNR). Source: TNS 2007.

Table 2: Sample Moments from Questions QC6 (expected stock market performance) and QC9 (past stock market performance); TNS 2007.

Variable	No obs.	Mean	Std. Dev.	Min	Max
Expected Return (ER)	2460	0.055311	0.112602	-0.625	1.125
Std. Dev. of ER	2460	0.068028	0.07347	0	0.43056
Past ER (pER)	2231	0.11938	0.139876	-0.375	0.375
Std. Dev. of pER	2231	0.065598	0.069211	0	0.375

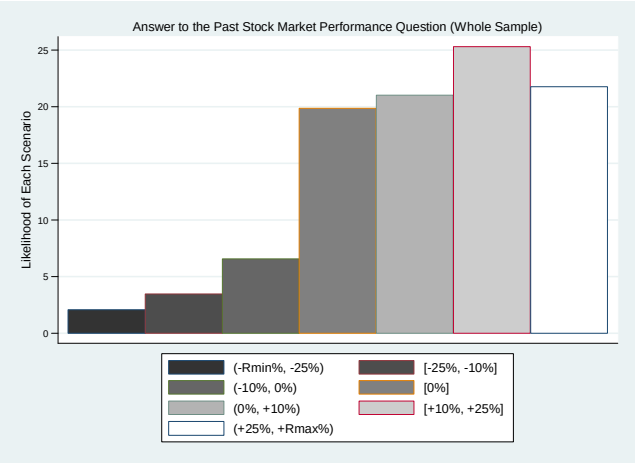


Figure 12: Histogram of average individual answers to the relative likelihood of the different scenarios regarding the stock market performance over the last 5 years. Source: TNS 2007.

In Figure 13, we depict the frequency distribution of responses to pPNR for all ages. As previously, there is bunching of responses around round numeric probability answers indicating that rounding is not specific to forward looking questions but rather, to respondents rounding when confronted with the probabilistic elicitation format. For all ages, the mean response is 68%, while the true answer is a 100% chance of a positive nominal return over the last 5 years. Around 44% of sample respondents (990 individuals) gave the correct answer:

In Figure 14 we examine what type of information had those respondents who were absolutely certain regarding the future evolution of the stock market (panel (b), Figure 5). Panel (a) shows that amongst those who were absolutely certain that the stock market would go down (24%, 567 answered PNR=0%), around 35% were absolutely certain that it had not increased over the last 5 years, while 43% were absolutely certain that it had gone up. Around 5% gave a 50 percent chance of either going up or down. This contrasts with panel (b), for respondents who were absolutely certain that the stock market would go up (21%, 446 answered PNR=100%): 83% were absolutely certain that the stock market had gone up, while only 6% gave answers consistent with absolutely certainty of the stock market having gone down. Only 2% gave a 50 percent response. Hence, individual

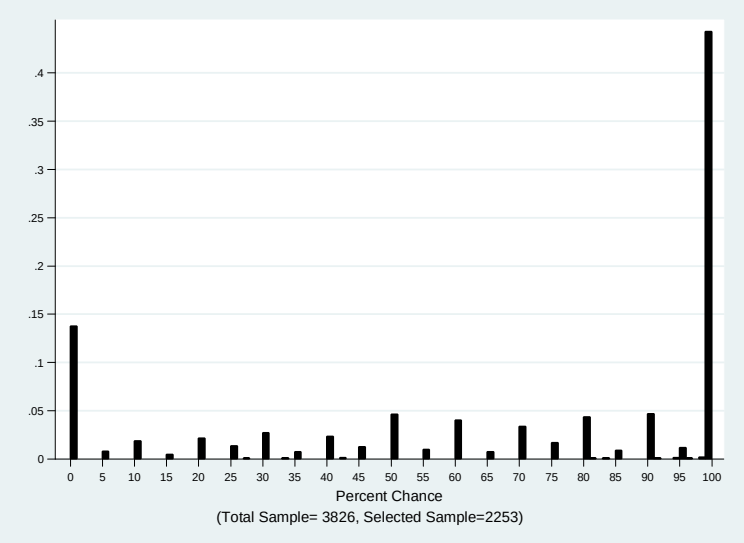
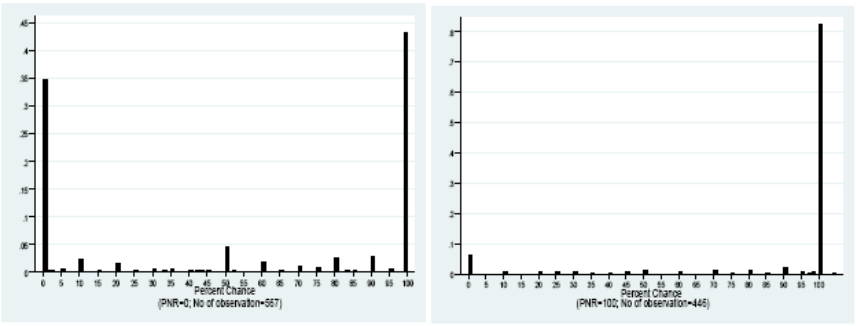


Figure 13: Percentage chance of a Positive Nominal Return over the past five years (pPNR) for all ages, frequency distribution. Source: TNS 2007.

information about the past significantly contributes to unbundle the bunching on responses conveying absolute certainty regarding the future, which are clearly wrong, and provides an additional source of heterogeneity amogst respondents.

Table 3 reports the distribution of responses and the response rate conditioning on age, gender and stockholding status. Since over the five-year time frame given to respondents, the CAC 40 index had increased by 20.2%, an informed respondent should have given an answer of $pPNR^i = 100$ percent. In accordance with the findings reported by Lusardi (2008) on the financial literacy of US adults, male respondents who are older, single and stockholders report higher mean (and lower standard deviations of) percentage chances of a past positive nominal return. The differential is 11.4 percentage points higher for men than for women. Although information broadly increases with age, irrespective of gender, the uncertainty of the reports decrease with age for males, while for females, remains broadly constant. Stockholders report a higher mean by about 10 percentage points, and are around 6 percentage points more likely to give a response. Figure 15 shows that males are broadly better informed than females:

Information about past stock market performance broadly increases with



Panel (a): How much do pessimists know? pPNR conditional on PNR=0%.

Panel (b): How much do optimists know? pPNR conditional on PNR=100.

Figure 14: pPNR conditional on PNR, for pessimists (a) and optimists (b), frequency distribution. Source: TNS 2007.

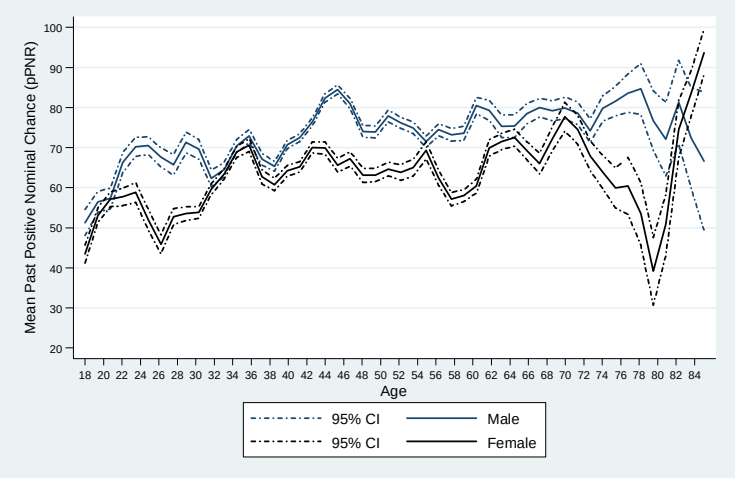


Figure 15: Mean pPNR by age and gender. Source: TNS 2007.

Table 3: Distribution of Responses to Past Positive Nominal Return (pPNR), by Attribute; TNS 2007

	Male							Female						
	Number of respondents			Quantile			Rate of response to	Number of respondents			Quantile			Rate of response to
Attribute	to pPNR	Mean	St. Dev.	0.25	0.50	0.75	pPNR	to pPNR	Mean	St. Dev.	0.25	0.50	0.75	pPNR
All Respondents	1,024	74.2	36.2	50	100	100	0.72	1,009	62.8	38.5	0	30	100	0.88
Married or living with a partner														
No	286	76.8	34.5	60	100	100	0.95	386	59.3	38.6	25	70	100	0.86
Yes	738	73.2	36.9	50	100	100	0.91	623	64.9	38.3	30	80	100	0.87
Age														
Under 30	132	66.6	36.8	40	82.5	100	0.94	156	52.5	38.2	17.5	50	90	0.83
30-39	215	66.8	39.3	30	80	100	0.93	235	63.1	38.4	25	75	100	0.87
40-49	223	77.9	33.6	60	100	100	0.93	208	65.9	36.7	40	80	100	0.92
50-59	219	74.7	37.2	50	100	100	0.87	201	69.3	39.0	25	75	100	0.94
60-69	137	80.2	33.2	10	75	100	0.89	123	68.3	38.6	30	90	100	0.90
70 and over	98	82.9	31.8	20	80	100	0.87	84	67.7	38.7	42.5	85	100	0.83
Holds stocks or mutual funds														
No	604	68.8	37.5	45	90	100	0.90	627	59.4	38.5	25	70	100	0.85
Yes	420	81.9	32.8	80	100	100	0.96	380	68.8	37.6	42.5	90	100	0.93

Note: Sample restricted to those with own or spouse/partner report of whether or not household holds 'stocks or stock mutual funds'.

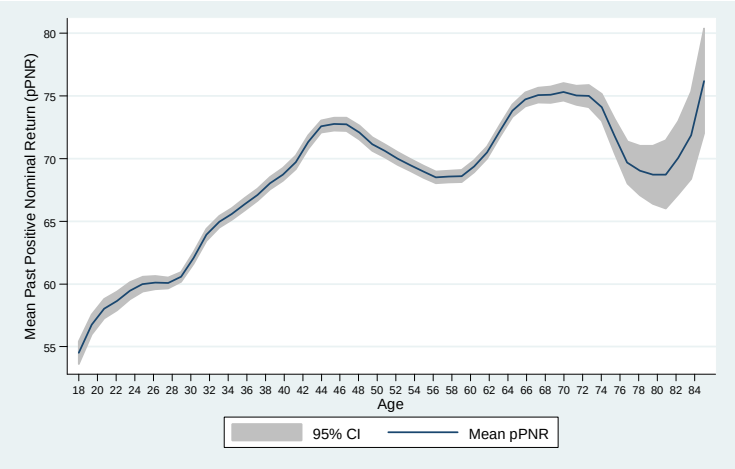


Figure 16: Mean percentage chance of a positive nominal return over the last 5 years (pPNR) by age. Source: TNS 2007.

age until the mid 70s, and then decreases, although the point estimates are much noisier. Figure 16 presents kernel-smoothed estimates of the mean percentage chance of a past positive nominal return conditional on age. The mean percentage chance of a past positive nominal return is estimated to increase (fall) by about 20 to 22 (10 to 12) percentage points as age increases until (decreases after) 75. Figure 16 suggests that respondents build an "informational stock" slowly through the life-cycle, which depreciates by the end of it. This process of life-cycle information accumulation may thus account for the identified pessimism amongst the young and the elderly, regarding the stock market future performance.

Figure 17 shows that information increases until the 50th percentile of wealth (€118,792), remains roughly constant until the 90th percentile (€413,476), only to increase again albeit very heterogeneously. The richest households (with wealth above the 90th percentile), may thus be more optimistic (and disagree more) regarding the future investment opportunities because they are better (and more heterogeneously) informed.[6] Relative to non-participation amongst the richest, and in line with Guiso and Jappelli (2005), heterogeneity in stock market information appears as a different alternative to social interactions (Hong, Kubik and Stein, 2004; Guiso,

[6] However, the increased heterogeneity in information for the richest might just be a small sample problem, since only 272 respondents answered to the information question.

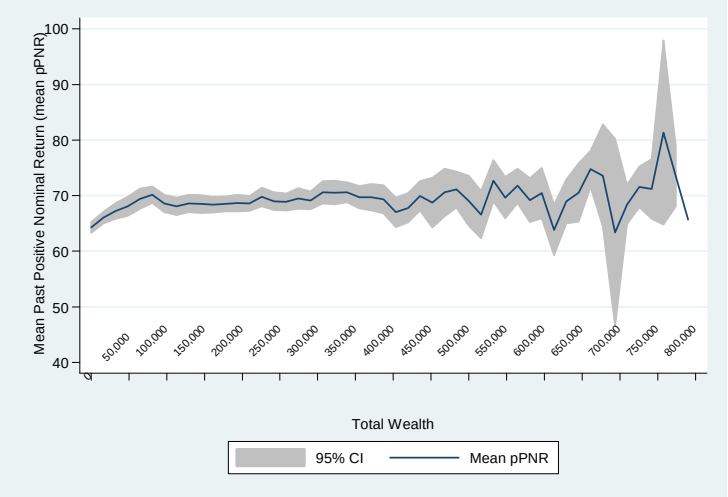


Figure 17: Mean percentage chance of a positive nominal return over the last 5 years (pPNR) by wealth. Source: TNS 2007.

Sapienza, Zingales, 2005), better private investment opportunities (Heaton and Lucas, 2000) or taxation (Poterba, 2002).

Surprisingly, information about past stock market performance does not increase with own's educational attainement, although it broadly increases with age within educational groups (Figure 18). Categorical answers to frequency, variety and access to specialised media as well as the number of stock market transactions over the last year, appear strongly positively related to information about past stock market performance. So does income, and a measure of optimism. Interestingly, although those who follow family advice are more likely to be uninformed, those who follow friends' advice are less likely to be so. On the other hand, access to broad media or measures of optimism, time and risk preference do not significantly explain information. Neither do parents' educational attainment or family background. These findings are consistent with financial information being slowly acquired through time, from own past experience (learning-by-investing), from others (social interactions) and from specialised media. On the other hand, the negative effect of the 'importance of money in life', which scores higher the poorer and the more financially constrained the respondent is, reveals a novel aspect in information acquisition: disenfranchisement. Those who would benefit most from being informed, are those that are paradoxically

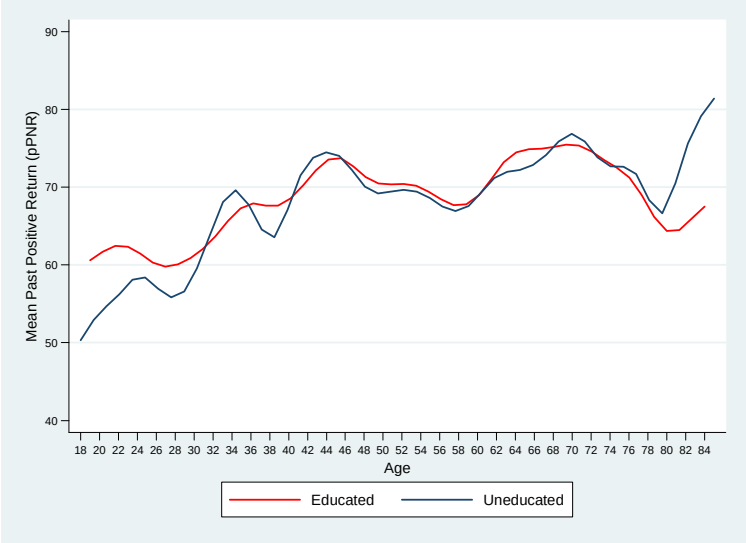


Figure 18: Mean percentage chance of a past positive nominal return (pPNR), by education. Source: TNS 2007.

more likely to be poorly informed. Table 14 in the appendix reports the estimation results of a simple Tobit specification.

3 Subjective Expectations, Information and Stock Market Participation

An important puzzle in the literature is why so few households hold stocks (Haliassos and Bertaut, 1995). Although the standard two-risky asset model predicts that decision takers invest in the risky asset if and only if its expected return exceeds the return of the riskless asset (Arrow, 1965; Merton, 1969; Samuelson, 1969), only recently have researchers started to collect data on subjective expectations of stock market returns.[7] To obtain subjective expectations from answers to the probability question (PNR^i), Dominitz and Manski (2007) show that if (i) stock market returns are normally dis-

[7] Notice that according to economic theory, the decision to invest in the stock market does not depend on either preferences, information about the past or endowments: just on the subjective expected return.

tributed, with cdf. $\Phi(.)$:

$$PNR^i = \Pr{}^i \left[R_{t+1}(5) > 0\right] = \Pr{}^i \left[\frac{R_{t+1}(5) - \mu_i}{\sigma_i} > -\frac{\mu_i}{\sigma_i}\right] = 1 - \Phi\left(-\frac{\mu_i}{\sigma_i}\right)$$

and if (ii) a common variance is assumed, $\sigma_i = \sigma$ (for example, equal to the value obtained from historical records), then:

$$\mu_i = -\sigma\Phi^{-1}\left(1 - PNR^i\right)$$

Since we inquire about a longer investment horizon, we exploited monthly data on the CAC 40 stock market index between July 1987 and July 2011 (230 observations) to compute the standard deviation of five-year log returns to be 0.19. When inserted into the above expression, the sample average percentage chance of a positive nominal return of 46 percent (reported in the appendix, Table 11) corresponds to a sample mean expected return of 0.019, about five times smaller than the historical mean of 0.108. A respondent reporting a value of $PNR^i = 72$ percent, would match the rational expectations prediction of 0.108.

Hence, respondents reporting a higher percentage chance that the stock market will increase over the next five years (PNR^i), have a higher subjective mean return expectation (μ_i), and should then be more likely to invest in the stock market.

In the TNS 2007, question qc19 inquires respondents about the different types of financial instruments and accounts they hold, and in particular whether they invest in the stock market (directly or indirectly). We define direct stockholdings as the sum of stocks of privatised public companies, listed stocks of private companies and stocks of foreign firms held. Indirect stockholdings are those held through mutual funds and managed investment accounts.[8] The proportion of households who hold stocks directly is 22%, and 37% either directly or indirectly. Although low, the participation rates are slightly higher than those obtained from previous past surveys[9] and similar to the figures reported by Haliassos (2008) for other countries at

[8] We exclude both government bonds and homeownership from the risky asset category, even if the latter are highly illiquid and indivisible (and therefore risky), because French households mostly buy houses for the flow of services they provide rather than as a financial investment. Still, in the estimation we control for the level of total net worth (real plus financial) and include a dummy variable that takes value one when home-ownership status is observed.

[9] For the 35-55 year-olds corresponding subsample in the Patrimoine 1998 INSEE survey, the proportion of households holding risky assets 'directly' is 21.6 and either directly or through mutual funds, 32.4.

that time. In Figure 4, stock market participation amongst respondents displays a clear hump-shaped pattern by age:

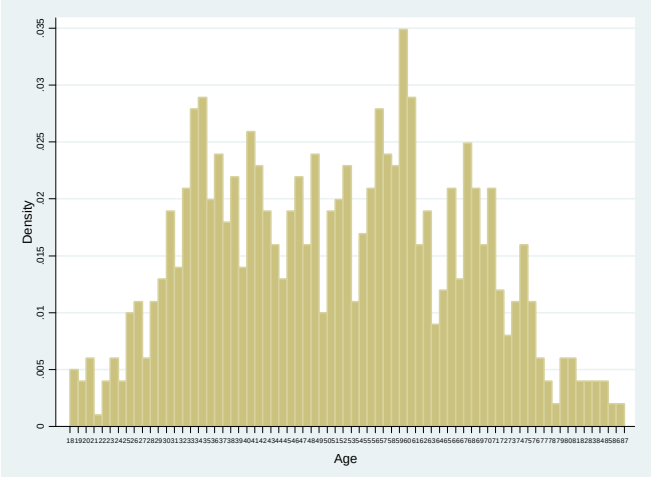


Figure 19: The probability of holding stocks and stock mutual funds, by age. Source: TNS 2007.

While Dominitz and Manski (2007) reported that the probability of holding stocks increased with the perceived chance of a positive return of investing in the stock market amongst the elderly, Table 4 shows a similar qualitative pattern for all ages, consistent with their findings and theoretical predictions. Despite our sample size being substantially smaller and a different elicitation methodology, the positive relationship between expectations and stockholdings conditional on gender and marital status appears strikingly robust. However, since the forecasting horizon is much longer (5 years instead of 1), the relationship appears less pronounced quantitatively. In addition, the probability of stockholding is much larger for those who anticipate a 0% chance of a positive return, and recedes as it increases beyond 80%.

The literature has found that those who are better educated, older and wealthier, are more likely to hold stocks. Since subjective expectations have been found to systematically vary with risk preferences, information, and demographic and socio-economic characteristics, here we estimate the *conditional effect* of the percentage chance of a positive nominal return on stockholdings. Conditioning on individual information is important, since Dominitz and Manski (2011) conjecture that differences in the way people

Table 4: Probability of Holding Stocks or Stock Mutual Funds Conditional on Percent Chance of Positive Nominal Return, Gender, Age and Marital Status.

	Married or living with a partner				*NOT* Married or living with a partner			
Percent chance	Male		Female		Male		Female	
of positive	Point	Standard	Point	Standard	Point	Standard	Point	Standard
nominal return	Estimate	Error	Estimate	Error	Estimate	Error	Estimate	Error
0	0.31	(0.02)	0.28	(0.02)	0.25	(0.02)	0.22	(0.02)
1-10	0.39	(0.06)	0.35	(0.06)	0.33	(0.06)	0.29	(0.06)
11-20	0.40	(0.05)	0.36	(0.05)	0.34	(0.05)	0.30	(0.05)
21-30	0.28	(0.04)	0.25	(0.04)	0.23	(0.04)	0.20	(0.03)
31-40	0.48	(0.05)	0.44	(0.05)	0.42	(0.05)	0.37	(0.05)
41-49	0.41	(0.08)	0.37	(0.07)	0.35	(0.07)	0.30	(0.07)
50	0.42	(0.04)	0.38	(0.04)	0.35	(0.04)	0.31	(0.04)
51-59	0.24	(0.09)	0.20	(0.08)	0.19	(0.08)	0.16	(0.07)
60-69	0.49	(0.05)	0.45	(0.05)	0.42	(0.05)	0.38	(0.05)
70-79	0.56	(0.04)	0.52	(0.05)	0.49	(0.05)	0.44	(0.05)
80-89	0.55	(0.05)	0.50	(0.05)	0.48	(0.05)	0.44	(0.05)
90-99	0.52	(0.05)	0.47	(0.05)	0.45	(0.05)	0.40	(0.05)
100	0.48	(0.02)	0.44	(0.03)	0.42	(0.03)	0.37	(0.03)
All	0.40	(0.02)	0.38	(0.02)	0.34	(0.02)	0.32	(0.02)

Source: TNS 2007.

use public information may explain much of the observed heterogeneity in subjective expectations, μ_i. They find that "A plurality, but not a majority, of persons revise their expectations in the direction predicted by the persistence model of behavioral finance." The persistence model maintains that recent stock market performance will persist into the near future. Our information measure $pPNR^i$ precisely measures the extent to which respondents know about recent past stock market performance.

We estimate households' probability of holding stocks $\Pr(\, s_t^i = 1 \big|\, p_{t+1}^i; p_t^i; \mathbf{x}_i)$ as a function of the percentage chance of a positive nominal return ($p_{t+1}^i \equiv PNR^i$), conditioning on information ($p_t^i \equiv pPNR^i$), and a vector of observables $\mathbf{x}_i$, which contains measures of time and risk preference, endowments (income and total wealth), household constraints (limited available liquidity, limited borrowing, fear of personal bakruptcy), demographics (age, gender and marital status) and inertial factors (who takes financial decisions, frequency of stock market transactions over the last year, stocks in pay) which have been found in the literature to matter at the extensive margin:

$$\Pr(\, s_t^i = 1 \big|\, p_{t+1}^i, p_t^i; \mathbf{x}_i) = \mathbf{\Phi}(\delta_{t+1} p_{t+1}^i + \delta_t p_t^i + \boldsymbol{\delta}' \mathbf{x}_i) \tag{1}$$

where $\mathbf{\Phi}(.)$ denotes the standard normal cumulative distribution function,

since we assume that there is and unobserved error term e_t^i normally distributed. Table 11 in the appendix reports descriptive statistics for the main variables, for the whole and the selected samples.

The results of the probit estimation are reported in Table 5, for all ages. The variables have the expected signs with minor differences across columns[10], confirming the robust effect of subjective expectations on the probability of holding stocks. A 1 percent increase in the percentage chance of a positive nominal return (corresponds to an 10 percent increase in the sample expected return,i.e. from 1.9% to 2.1%) increases the probability of holding stocks by 0.001%, which corresponds to an increase of 0.1% in the unconditional probability (from 37.5% to 37.6%). [11] Interestingly, the positive effect of information becomes statistically insignificant once heterogeneity in either preferences, decision taking or constraints is taken into account:

If capital markets are imperfect (transaction or informational costs) households' income and wealth influences portfolio choice[12]. The empirical analysis reveals that their effect is best captured by a second order polynomial, which facilitates the comparison with existing results in the literature (Guiso *et al.* (1996, 2003), Haliassos and Bertaut (1995) or King and Leape (1998)). Total net worth has a positive effect on participation and is significant at the 1% level. An increase in total wealth from the first decile (6,300 euros) to the ninth decile (450,000 euros) increases the probability of participation by 9%. Income also increases the probability of participation in the stock market, moving from the first to the ninth decile increases the probability of stockownership by 13%. The effects are consistent with fixed transaction and information costs of accessing the stock market, as well as of decreasing aversion to financial risk taking, since both capture households' initial endowments other than housing.

Although previous empirical studies also find that education increases the probability of participation, most of them interpret its effect as a proxy for information. Since we have a very good direct measure of how informed respondents are regarding the stock market, it is surprising that holding a

[10] Results in Table 3 only refer to direct and indirect stockownership. But the sign and magnitude of the reported estimates are robust to changes in the definition of stockownership (only direct stockholders). They are also robust to a semi-log specification in income and financial wealth.

[11] Although the effect appears quantitatively small, it is actually not. See Hurd *et al.* (2011), Kezdi and Willis (2009) or Arrondel *et al.* (2011).

[12] See King and Leape (1998) and simulated results by Cocco *et al.* (2005) or Haliassos and Michaelides (2003).

Table 5: Probability of Holding Stocks or Stock Mutual Funds (All Ages); TNS 2007

	(1)	(2)	(3)	(4)	(5)	(6)
Positive nominal return (PNR)	0.00185***	0.00146***	0.00139***	0.00111***	0.00121***	0.00140***
	(0.000279)	(0.000299)	(0.000301)	(0.000310)	(0.000372)	(0.000352)
Male	0.0112	0.00108	-0.000288	-0.0177	0.00522	0.0105
	(0.0220)	(0.0223)	(0.0224)	(0.0241)	(0.0294)	(0.0292)
Married/living with a partner	0.0572**	0.0585**	0.0688***	-0.0182	-0.0503	-0.0519
	(0.0238)	(0.0238)	(0.0239)	(0.0267)	(0.0320)	(0.0320)
Age	0.00789*	0.00711*	0.00603	-0.00585	0.00372	0.00433
	(0.00424)	(0.00426)	(0.00433)	(0.00461)	(0.00569)	(0.00567)
Age squared	-2.67e-05	-2.10e-05	1.34e-06	8.64e-05*	-4.24e-06	-8.98e-06
	(4.24e-05)	(4.25e-05)	(4.34e-05)	(4.59e-05)	(5.60e-05)	(5.59e-05)
Past positive nominal return (pPNR)		0.00115***	0.00105***	0.000853**	0.000642	
		(0.000321)	(0.000323)	(0.000333)	(0.000394)	
Education						
(Ref. category: High school or less)						
Less than college			0.115***	0.0450	0.0359	0.0359
			(0.0396)	(0.0417)	(0.0520)	(0.0520)
College or more			0.256***	0.113**	0.126**	0.127**
			(0.0438)	(0.0484)	(0.0576)	(0.0576)
Income (10E-6)				7.204***	6.076**	6.035**
				(2.300)	(2.971)	(2.964)
Income squared (10E-11)				-6.760**	-8.035**	-7.836*
				(2.989)	(4.081)	(4.066)
Net worth (10E-7)				12.94***	9.874***	9.880***
				(2.035)	(2.470)	(2.470)
Net worth squared (10E-13)				-7.975**	-4.906	-4.918
				(3.262)	(3.262)	(3.943)
Self account management					-0.137***	-0.136***
					(0.0271)	(0.0271)
Risk aversion (CARA)					-0.219	-0.239
					(0.353)	(0.353)
Liqudity constraint					-0.116***	-0.117***
					(0.0294)	(0.0294)
Firm shares in remuneration					0.0656	0.0676
					(0.0566)	(0.0565)
Temporal preference					0.0120*	0.0118*
					(0.00650)	(0.00649)
Online banking					0.101***	0.103***
					(0.0314)	(0.0313)
Pseudo R-squared	0.0426	0.0472	0.0639	0.1191	0.1251	0.1239
Chi-squared	118.1	131.0	177.3	320.0	265.6	262.9
Log-likelihood	-1327	-1321	-1298	-1183	-928.7	-930.1
No of observations	2,066	2,066	2,066	2,016	1,536	1,536

Note: (i) Standard errors are in parentheses. (ii) *** p<0.01, ** p<0.05, * p<0.1

college degree (or further) increases the probability of participation by 12%, relative to those who hold only a high school diploma or less.

Management variables also appear very significant: those who take financial decisions by themselves are around 14 percent less likely to participate, than those who totally or partially delegate in a financial advisor. Those who manage their accounts online (online banking) are 10 percent more likely to participate than those who do not. However, measures of preference heterogeneity, are less important: Individuals who have a long planning horizon (temporal preference) are 1.2 percent more likely to participate than those who are impatient. Although more risk averse individuals have a lower probability of participation, the effect is not statistically significant.

Constraints also appear very significant: Households who have been liquidity constrained or who think that they will be so in the future are less likely to participate (around 11%). Deaton (1992) explains how the expectation of being liquidity constrained in the future leads prudent households to save more ('buffer stock'), while Elmendorf and Kimball (2000) prove that the positive wealth effect of increased precautionary savings that leads decreasing risk averse (DARA) households to invest more in stocks is dominated by the negative increase in risk if households are also decreasingly prudent (DAP), resulting in an overall reduction in stockownership. [13]

Finally, the age variables indicate that the probability of owning risky assets is lower for younger households, although it has a hump-shaped effect reaching its maximum at the age of 50. In Tables 6 and 7 below, we decompose the effect of expectations on stock market participation by age groups.

Robustness

In Table 6 we report the results of the estimation for respondents in the same age bracket (50-80) as those exploited by Dominitz and Manski (2007) from the HRS 2004. Two main messages emerge: (1) Dominitz and Manski's (2007) results are robust to the inclusion of covariates that have been identified as important in the empirical literature of household finance, like transaction costs (income and welath), liquidity constraints, access to the internet or delegation in financial decision taking. (2) For the elderly, and consistently with economic theory, subjective expectations regarding the future performance of the sotck market determine their financial investment

[13] See also Gollier (2001), who proves that the willigness to take risk is reduced in the presence of a liquidity constraint if absolute risk tolerance is increasing and convex in wealth.

decisions at the extensive margin. Information regarding past stock market performance does not because, as Figure 16 illustrates, they are overall very well informed.

In Table 7, we complete the life-cycle picture and report the estimation results only for the young (18-49 age bracket). The main message conveyed is that although subjective expectations determine the decision to enter the stock market by the young *unconditionally*, once we condition on individual information, the effect of expectations becomes statistically insignificant. The results, together with Figure 16, lend support to Hurd's (2009) conjecture: what determines stock market participation amongst the young is their degree of awareness, measured by the likelihood that the stock market has gone up over the last five years (pPNR):

So far the definition of stockholdings includes investments in stocks in mutual funds, which are typically professionally managed. One could then conjecture that the relationship between subjective expectations and the decision to participate in the stock market would be stronger for a narrower definition, for which the respondents' decisions would be more directly linked to the respondents' expectations.

Table 8 reports the estimation results of subjective expectations on a narrower definition of stockholdings (direct stockholders) which excludes investment in the stock market through mutual funds, by age groups (18-49, 50-80 and all ages). For each age group, we examine the within effect that conditioning on information (column 2) has on the unconditional effect (column 1) of anticipated stock market performance on the decision.to invest in shares of national and foreign firms. For all age groups, the main message remains. Importantly, comparison of the last two columns of the table lends support to Dominitz and Manski's (2011) conjecture about the importance of heterogeneity in the amount of public information when accounting for heterogeneity in subjective expectations: part of the effect of expectations on actions (all ages, column 1) comes from the effect of information on expectations (all ages, column 2). However, the advanced conjecture does not seem to hold since the marginal effect of expectations on direct stockholding decisions appears quantitatively smaller than in the previous tables:

Finally, Table 9 reports the estimation results by financial decision taker (Account Manager) and by respondent's information. For each group, we examine the effect of conditioning on information (column 2, within each group) on the unconditional effect (column 1 within each age group) of subjective expectations on the decision.to invest (directly and indirectly) in risky assets. Irrespective of who takes financial decisions, or of how informed respondents are, expectations determine financial decisions.

Table 6: Probability of Holding Stocks or Stock Mutual Funds (50 ≤ Age ≤ 80); TNS 2007

	(1)	(2)	(3)	(4)	(5)	(6)
Positive nominal return (PNR)	0.00194***	0.00179***	0.00179***	0.00144***	0.00169***	0.00165***
	(0.00043)	(0.000457)	(0.000459)	(0.000481)	(0.000562)	(0.000536)
Male	0.0195	0.0144	-8.16E-05	-0.0328	0.00345	0.00195
	(0.0359)	(0.0363)	(0.0366)	(0.0404)	(0.0478)	(0.0474)
Married/living with a partner	0.0542	0.0542	0.0685*	-0.0117	-0.0538	-0.0534
	(0.0392)	(0.0393)	(0.0396)	(0.0441)	(0.0514)	(0.0514)
Age	0.0763**	0.0758**	0.0840**	0.0647*	0.0866**	0.0866**
	(0.0352)	(0.0353)	(0.0356)	(0.037)	(0.0421)	(0.0421)
Age squared	-0.000567**	-0.000564**	-0.000620**	-0.000472	-0.000675**	-0.000675**
	(0.000279)	(0.000279)	(0.000282)	(0.000292)	(0.000333)	(0.000333)
Past positive nominal return (pPNR)		0.0005	0.000507	0.000387	-0.000148	
		(0.000503)	(0.000505)	(0.000529)	(0.000615)	
Education						
(Ref. category: High school or less)						
Less than college			0.135***	0.0799	0.0642	0.0639
			(0.0486)	(0.0513)	(0.0605)	(0.0605)
College or more			0.204***	0.0568	0.0868	0.0872
			(0.0548)	(0.0645)	(0.0735)	(0.0735)
Income (10E-6)				8.739**	5.832	5.862
				(3.905)	(4.401)	(4.406)
Income squared (10E-11)				-8.942*	-7.468	-7.547
				(5.426)	(5.762)	(5.769)
Net worth (10E-7)				14.62***	12.65***	12.66***
				(3.37)	(4.027)	(4.026)
Net worth squared (10E-13)				-10.73**	-9.021	-9.037
				(5.048)	(5.979)	(5.977)
Self account management					-0.190***	-0.190***
					(0.0419)	(0.0419)
Risk aversion (CARA)					-0.334	-0.328
					(0.501)	(0.501)
Liquidity constraint					-0.102**	-0.102**
					(0.0498)	(0.0498)
Firm shares in remuneration					-0.0448	-0.0454
					(0.108)	(0.108)
Temporal preference					0.0157	0.0156
					(0.0108)	(0.0108)
Online banking					0.140***	0.139***
					(0.0522)	(0.052)
Pseudo R-squared	0.0298	0.0306	0.042	0.0989	0.1233	0.1233
Chi-squared	34.89	35.88	49.23	110.9	107.6	107.6
Log-likelihood	-568.6	-568.1	-561.4	-505.1	-382.6	-382.6
No of Observations	847	847	847	813	633	633

Note: (i) Standard errors are in parentheses. (ii) *** p<0.01, ** p<0.05, * p<0.1

Table 7: Probability of Holding Stocks or Stock Mutual Funds (Age< 50); TNS 2007

	(1)	(2)	(3)	(4)	(5)	(6)
Positive nominal return (PNR)	0.00177***	0.00118***	0.00106***	0.000750*	0.000747	0.00119**
	(0.000365)	(0.000392)	(0.000393)	(0.000403)	(0.0005)	(0.00047)
Male	0.0124	0.000113	0.0115	0.000977	0.0162	0.0253
	(0.0277)	(0.0279)	(0.0281)	(0.0302)	(0.0379)	(0.0376)
Married/living with a partner	0.0322	0.0370	0.0491	-0.0379	-0.0586	-0.0625
	(0.031)	(0.031)	(0.031)	(0.0348)	(0.0426)	(0.0425)
Age	0.0453***	0.0436***	0.0335**	2.45E-02	0.0201	0.0214
	(0.0146)	(0.0146)	(0.015)	(0.0158)	(0.0209)	(0.0208)
Age squared	-0.000584***	-0.000573***	-0.000420**	-0.000371*	-0.000277	-0.000284
	(0.000206)	(0.000207)	(0.000212)	(0.000223)	(0.000292)	(0.000291)
Past positive nominal return (pPNR)		0.00165***	0.00143***	0.00122***	0.00136***	
		(0.000411)	(0.000414)	(0.000423)	(0.000518)	
Education *(Ref. category: High school or less)*						
Less than college			0.168*	0.0892	0.155	0.142
			(0.0874)	(0.0909)	(0.134)	(0.134)
College or more			0.346***	0.197*	0.271*	0.264*
			(0.0988)	(0.103)	(0.141)	(0.14)
Income (10E-6)				5.721*	5.547	5.558
				(3.052)	(4.395)	(4.386)
Income squared (10E-11)				-5.042	-7.319	-7.036
				(3.973)	(6.401)	(6.39)
Net worth (10E-7)				11.16***	8.347***	8.498***
				(2.556)	(3.185)	(3.186)
Net worth squared (10E-13)				-4.845	-2.778	-3.004
				(4.472)	(5.581)	(5.595)
Self account management					-0.0922***	-0.0893**
					(0.0357)	(0.0355)
Risk aversion (CARA)					-0.0456	-0.0708
					(0.504)	(0.505)
Liquidity constraint					-0.120***	-0.121***
					(0.0366)	(0.0365)
Firm shares in remuneration					0.108	0.111*
					(0.0674)	(0.0673)
Temporal preference					0.0132	0.0115
					(0.00818)	(0.00814)
Online banking					0.0707*	0.0713*
					(0.0381)	(0.038)
Pseudo R-squared	0.0315	0.0422	0.657	0.1247	0.124	0.1181
Chi-squared	47.65	63.78	99.36	185.4	147.6	140.7
Log-likelihood	-732.4	-724.3	-706.5	-650.8	-521.5	-525
No of Observations	1,188	1,188	1,188	1,174	880	880

Note: (i) Standard errors are in parentheses. (ii) *** p<0.01, ** p<0.05, * p<0.1

Table 8: Probability of Holding Stocks (Only); TNS 2007

	Age< 50		50 ≤ Age ≤ 80		All ages	
	(1)	(2)	(1)	(2)	(1)	(2)
Positive nominal return (PNR)	0.000900**	0.000389	0.00107**	0.000850*	0.00102***	0.000682**
	(0.000364)	(0.000413)	(0.000453)	(0.000515)	(0.000281)	(0.000320)
Male	0.00341	-3.53e-05	0.0165	0.0115	0.00509	0.00228
	(0.0289)	(0.0310)	(0.0396)	(0.0441)	(0.0232)	(0.0253)
Married/living with a partner	-0.0233	-0.0286	-0.0575	-0.0391	-0.0378	-0.0321
	(0.0334)	(0.0355)	(0.0451)	(0.0489)	(0.0264)	(0.0282)
Age	-0.0149	-0.0124	0.0283	0.0135	0.00387	0.00247
	(0.0160)	(0.0171)	(0.0367)	(0.0395)	(0.00461)	(0.00496)
Age squared	0.000210	0.000156	-0.000235	-0.000123	-1.83e-05	-5.40e-06
	(0.000222)	(0.000237)	(0.000290)	(0.000313)	(4.52e-05)	(4.84e-05)
Past positive nominal return (pPNR)		0.00129***		0.000348		0.000851**
		(0.000433)		(0.000566)		(0.000343)
Education *(Ref. category: High school or less)*						
Less than college	0.177	0.164	0.0649	0.0860	0.0462	0.0588
	(0.120)	(0.130)	(0.0528)	(0.0580)	(0.0421)	(0.0459)
College or more	0.254	0.223	0.0884	0.119	0.0818	0.0936*
	(0.168)	(0.172)	(0.0693)	(0.0762)	(0.0506)	(0.0551)
Income (10E-6)	4.623	4.347	6.164	6.135	5.182**	5.126**
	(3.094)	(3.528)	(3.893)	(4.222)	(2.229)	(2.487)
Income squared (10E-11)	-2.168	-3.101	-7.080	-7.433	-4.546	-5.365
	(4.167)	(4.970)	(5.250)	(5.587)	(2.861)	(3.285)
Net worth (10E-7)	10.46***	8.488***	12.93***	13.58***	10.95***	10.17***
	(2.351)	(2.512)	(3.344)	(3.733)	(1.927)	(2.089)
Net worth squared (10E-13)	-11.17***	-6.981*	-12.52**	-13.22**	-10.48***	-8.745***
	(3.776)	(4.101)	(4.877)	(5.358)	(2.917)	(3.146)
Self account management	-0.0502*	-0.0652**	-0.0424	-0.0417	-0.0493**	-0.0563**
	(0.0275)	(0.0296)	(0.0365)	(0.0397)	(0.0220)	(0.0237)
Risk aversion (CARA)	-0.0867	-0.229	-0.650	-0.677	-0.364	-0.431
	(0.380)	(0.390)	(0.437)	(0.451)	(0.280)	(0.289)
Liquidity constraint	-0.0710**	-0.0719**	-0.0936**	-0.105**	-0.0852***	-0.0887***
	(0.0285)	(0.0304)	(0.0406)	(0.0444)	(0.0234)	(0.0252)
Firm shares in remuneration	0.0433	0.0462	-0.0461	-0.0613	0.0190	0.0195
	(0.0525)	(0.0561)	(0.0883)	(0.0920)	(0.0462)	(0.0494)
Temporal preference	-0.00163	-0.000951	0.0118	0.0121	0.00358	0.00308
	(0.00634)	(0.00675)	(0.00916)	(0.0104)	(0.00528)	(0.00577)
Online banking	0.117***	0.120***	0.237***	0.245***	0.161***	0.165***
	(0.0305)	(0.0323)	(0.0501)	(0.0526)	(0.0272)	(0.0288)
Pseudo R-squared	0.1245	0.1253	0.1222	0.1260	0.1232	0.1241
Chi-squared	135.3	121.7	110.7	102.1	251.4	227.0
Log-likelihood	-475.8	-425.0	-397.9	-353.9	-894.3	-800.9
No of observations	989	880	720	633	1,734	1,536

Note: (i) Standard errors are in parentheses. (ii) *** p<0.01, ** p<0.05, * p<0.1

Table 9: Probability of Holding Stocks or Stock Mutual Funds; by Account Manager and Information; TNS 2007

	Self account management		Financial advisor or other		pPNR=100	pPNR< 100
	(1)	(2)	(1)	(2)	(1)	(2)
Positive nominal return (PNR)	0.00116***	0.000842*	0.00157***	0.00173***	0.000788*	0.00144***
	(0.000445)	(0.000505)	(0.000482)	(0.000551)	(0.000473)	(0.000546)
Male	0.105***	0.0918**	-0.0869**	-0.0897**	0.0860**	-0.0733*
	(0.0378)	(0.0405)	(0.0393)	(0.0424)	(0.0435)	(0.0388)
Married/living with a partner	-0.0716*	-0.0448	-0.0700	-0.0494	-0.110**	0.000635
	(0.0421)	(0.0445)	(0.0435)	(0.0465)	(0.0464)	(0.0422)
Age	0.00203	-0.000307	0.0110	0.00798	-0.00357	0.00683
	(0.00742)	(0.00796)	(0.00778)	(0.00825)	(0.00856)	(0.00760)
Age squared	-3.90e-06	1.90e-05	-5.82e-05	-2.87e-05	3.55e-05	-1.56e-05
	(7.35e-05)	(7.89e-05)	(7.65e-05)	(8.09e-05)	(8.25e-05)	(7.61e-05)
Past positive nominal return (pPNR)		0.000830		0.000383		
		(0.000551)		(0.000566)		
Education						
(Ref. category: High school or less)						
Less than college	0.0302	0.0618	0.0246	0.0386	-0.00588	0.0586
	(0.0728)	(0.0788)	(0.0648)	(0.0704)	(0.0755)	(0.0698)
College or more	0.0872	0.120	0.162**	0.160**	0.0389	0.184**
	(0.0806)	(0.0866)	(0.0725)	(0.0775)	(0.0832)	(0.0806)
Income (10E-6)	8.094*	6.531	5.340	5.792	6.522	5.544
	(4.379)	(4.645)	(3.666)	(4.252)	(4.102)	(5.574)
Income squared (10E-11)	-9.127	-8.283	-6.399	-8.299	-8.745*	-8.273
	(6.737)	(7.016)	(4.567)	(5.737)	(5.107)	(10.11)
Net worth (10E-7)	11.59***	10.68***	9.936***	9.542***	11.92***	8.421***
	(3.237)	(3.452)	(3.306)	(3.552)	(3.654)	(3.297)
Net worth squared (10E-13)	-6.346	-4.771	-6.049	-5.840	-4.941	-5.769
	(5.132)	(5.409)	(5.384)	(5.796)	(5.885)	(5.243)
Risk aversion (CARA)	-0.652	-0.780*	0.737	0.750	-0.102	-0.446
	(0.433)	(0.452)	(0.584)	(0.590)	(0.443)	(0.567)
Liquidity constraint	-0.0718*	-0.0844**	-0.121***	-0.127***	-0.115**	-0.116***
	(0.0392)	(0.0420)	(0.0395)	(0.0420)	(0.0454)	(0.0379)
Firm shares in remuneration	0.0871	0.0728	0.0327	0.0475	0.0398	0.0835
	(0.0741)	(0.0791)	(0.0788)	(0.0819)	(0.0759)	(0.0844)
Temporal preference	0.0103	0.0101	0.0147*	0.0133	0.0163*	0.0108
	(0.00860)	(0.00922)	(0.00854)	(0.00922)	(0.00951)	(0.00876)
Online banking	0.135***	0.136***	0.0341	0.0333	0.0717	0.118***
	(0.0392)	(0.0412)	(0.0463)	(0.0488)	(0.0439)	(0.0447)
Self account management					-0.116***	-0.156***
					(0.0401)	(0.0359)
Pseudo R-squared	0.1421	0.1404	0.1291	0.1240	0.1193	0.1299
Chi-squared	174.1	154.1	148.3	125.3	117.2	142.3
Log-likelihood	-525.5	-471.7	-500.4	-442.8	-432.3	-481.3
No of observations	905	806	829	730	713	822

Note: (i) Standard errors are in parentheses. (ii) *** p<0.01, ** p<0.05, * p<0.1

Two additional observations are worth making: Firstly, for those who do not take financial decisions by themselves but rather delegate completely or partiallly to professionals, the conditional effect (column 2, financial advisor or other) is quantitatively larger both within (column 1, financial advisor or other) and relative to those who take all financial decisions by themselves (column 2, self-account management). Secondly, even amongst the uninformed, the effect of expectations on stock market participation is quantitatively very important and statistically very significant (column 2, pPNR<100), corroborating the basic economic theory prediction (Arrow, 1965; Merton, 1969). Compared to the informed (column 1, pPNR=100), expectations matter even more. [14] We rationalize this last finding as follows: if information determines expectations, within the most homogeneous information group one would expect expectations to differ less, and hence to be less important empirically in accounting for differences in investment decisions. Dominitz and Manski (2011) report evidence consistent with persistence in the modal type of revision of expectations with new public information maps. Hence, if the informed process information similarly, they will revise their expectations similarly, and there will be less cross-sectional variation in their expectations than there will be amongst the uninformed.

4 Conclusion and Extensions

Elementary static (Arrow, 1965) and dynamic (Merton, 1969; Samuelson, 1969) models of portfolio choice put emphasis on the importance of individuals' expectations to explain stock market participation. However, it has been pervasive in the empirical literature on household portfolios to adopt the rational expectations assumption, thus neglecting a potential source of heterogeneity that, in addition to heterogeneity in preferences, endowments and constraints, could help reconcile economic theory predictions with empirically observed low participation rates.

In line with some recent efforts in the literature (Dominitz and Manski, 2007; Hurd *et al.*, 2011; Kézdi and Willis, 2009), here we have collected novel data on households' expectations and, importantly, on households' information sets (TNS 2007). To the best of our knowledge, nobody has used

[14] This effect appears very robust to loosening the definition of "informed". For example, when classifying respondents as informed if "pPNR>50" (those who gave more than a 50-50 percent chance of the stock market index going up over the last 5 years), and uninformed otherwise, the marginal effect of expectations on decisions for the informed was 0.0021, whereas for the uninformed was 0.0057.

before probabilistic elicitation to measure information at the individual level, and its robustness/usefulness remains to be ascertained by further work.

To validate our novel data set, and for comparison purposes, we have adopted Dominitz and Manski's (2007) methodology. Our results confirm that the novel effect of expectations on the decision to participate in the stock market first identified by them, is robust to the inclusion of measures of information, risk and time preference, endowments, constraints and management, for a representative sample by age. Most of the included factors had been previously identified in the literature as important determinants of age-portfolio profiles at the extensive margin. Similar conclusions ground the works by Hurd *et al.* (2011) or Kézdi and Willis (2009).

Taking advantage of our novel information measure, we are able to (i) confirm Hurd's (2009) conjecture, on the importance of being aware of the investment opportunities offered by the stock market, specially to account for low participation rates of the young; (ii) confirm the basic principle of elementary portfolio choice models, since even amongst the uninformed, subjective stock market expectations determine their decision to participate; (iii) confirm the effect of social interactions, professional advice, past experience and specialised media, as relevant sources of information at the individual level, thereby contributing to the literature of financial literacy.

However many questions remain, that would require further data collection and analysis[15]. Perhaps the most important one is that much observed heterogeneity remains unexplained at the extensive margin. In light of our results, attempts to understand Dominitz and Manski's (2011) conjecture about heterogeneity processing in public information feeding heterogeneity in subjective expectations, is likely to be the most promising and challenging one.

[15] Data collection is crucial if one aims at understanding the macroeconomic implications and derive policy reccomendations using a realistically calibrated dynamic macroeconomic model (see for example Alan, 2010).

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Appendix

1. Variable Definitions

Total net worth: In the survey, the respondent is asked in which of the eight predefined available brackets is her household situation. As we are interested in a continuous measure, we have used the method of simulated residuals (Gourieroux et al. 1987). We have regressed an ordered probit of the respondents' total wealth on some household characteristics. Once we have the estimated total wealth, a normally distributed error is added. We then check if the value falls inside the bracket originally chosen by the individual. If not, another normal error is added and so on until we predict the true interval. Doing so allows us to overcome the non-response problem for some households. If there is a missing value, the predicted value plus a normal error is directly used. Total wealth is given in Euros.

Income: For the income of the household, the survey asks the respondent which of the 7 predefined available brackets better corresponds to her situation. Income refers to the individual's household annual income in Euros.

Absolute risk aversion (CARA): The following question is asked to the respondent: 'If someone suggests that you make an investment whereby you have one chance out of two win 5000 euros and one chance out of two of losing the capital invested, how much (as a maximum) will you invest?' The coefficient of absolute risk aversion (CARA) is computed as $A_i(w_i) = 2(5000 - Z_i/5000^2 + Z_i^2)$ as in Guiso and Paiella (2008), where Z_i is the amount that the respondent declares to be willing to invest. Those who declare $Z_i < 5000$ are risk-averse $Z_i = 5000$, are risk-neutral and $Z_i > 5000$ are risk-takers. For further details regarding the measure of absolute risk aversion (CARA), we direct the reader to their Guiso and Paiella's work.

Liquidity constrained: Respondents are asked if they ever had to struggle to pay their budget. It is a dummy variable that takes value 1 if the respondent answers the question in the categories 'very often' or 'often', and value 0 otherwise.

Temporal preference: It is a numerical scale from 0 to 10. The surveys asks the respondent about her attitude regarding life: 0 represents living the present (impatience) and 10 only caring about the future (extreme patience).

Gender: is a dummy variable equal to 1 if the household head is a male, and is equal to 0, if a female.

Marital status: Marital status is based on current legal marital status. Respondents who are married or/and living with a partner are coded as 1, and 0 otherwise.

Education: is a categorical variable, grouped into three broad categories: High school or less (primary and secondary), some college (technical degrees beyond high school but below college, including professional and vocational degrees) and college or more (BAs, BScs, MScs, MBAs, professional certifications, PhDs and postdoctoral students).

Self portfolio management: The survey asks to the respondent who takes the household's financial decisions (stocks, SICAV/FCP bonds, life insurance contracts, saving accounts). Respondents who answer 'themselves' or 'them with their partners' are coded as 1, and 0 otherwise (which includes sharing some decisions with a financial advisor, or the financial advisor taking all decisions on the households' behalf).

Online banking: It is a dummy variable that takes value 1 if the respondent uses the internet for managing her financial accounts, and 0 otherwise.

Firm shares in remuneration: It is a dummy variable that takes value 1 if the respondent receives shares of the firm he works in as part of her compensation package/remuneration, and 0 otherwise.

Past frequency of trade: Respondents are asked about the number of stock market operations closed over the year prior to the date in which the survey was conducted (March 2006-March 2007). The answers are categorical: no operations, 1-2 operations, 3-5 operations, 6 or more operations.

Information variables:

* Respondents are inquired, for each alternative source of information (Friends, family, financial advisors, general media and specialised media), about the relative frequency of consultation (often, sometimes or never). For each information source, a dummy variable is created which takes value 1 if the answer is 'often', and 0 otherwise.

* Respondents are inquired, for each alternative source of TV information (General information and economics emissions) , about the relative frequency of consultation (very often, often, occasionally, sometimes or never). For each information source, a dummy variable is created which takes value 1 if the answer is 'often' or 'very often', and 0 otherwise.

Importance of Money in Life: Respondents are asked about the relative importance of money in life. It is a quantitative variable on a discrete scale from 0 to 10.

Mother's education: The respondent is inquired about the educational attainment of her mother. Three categories are available: less than High school, completed High school and more than High school. The reference category is 'less than High school'.

Father's education: The respondent is inquired about the educational attainment of her father. Three categories are available: less than High school, completed High school and more than High school. The reference category is 'less than High school'.

Family background: The respondent is inquired about her family background. Three categories are available: Middle class, low class and neither middle nor low class. The reference category is 'neither middle nor low class'.

2. Additional Tables

2.1 Missing/Erroneous answers to the expectations question:

We estimate a Probit specification for erroneous or missing answers (1 if answer to qc6 missing or does not add up to 100) as a function of stockholding, and covariates (gender, marital status, education, risk preference):

Table 10: Probability of Missing or Erroneous Answers to the Expectations Question; TNS 2007.

	(1)	(2)	(3)	(4)	(5)
Stockholding	-0.202***	-0.198***	-0.193***	-0.170***	-0.150***
	(0.0156)	(0.0157)	(0.0158)	(0.0164)	(0.0166)
Male		-0.0792***	-0.0697***	-0.0712***	-0.0786***
		(0.0157)	(0.0159)	(0.0161)	(0.0161)
Married/living with a partner			-0.0668***	-0.0718***	-0.0664***
			(0.0167)	(0.0169)	(0.0171)
Education (Ref. category: High school or less)					
Less than college				-0.168***	-0.156***
				(0.0228)	(0.0232)
College or more				-0.256***	-0.246***
				(0.0208)	(0.0209)
Temporal preference					-0.00357
					(0.00319)
Pseudo R-squared	0.0293	0.0343	0.0375	0.0601	0.0558
Chi-squared	148.1	173.2	189.4	303.3	269.7
Log-likelihood	-2449	-2437	-2429	-2372	-2282
No of observations	3,826	3,826	3,826	3,826	3,715

Note: (i) Standard errors in parentheses. (ii) *** p<0.01, ** p<0.05, * p<0.1

2.2 Descriptive Statistics:

Table 11: Descriptive Statistics

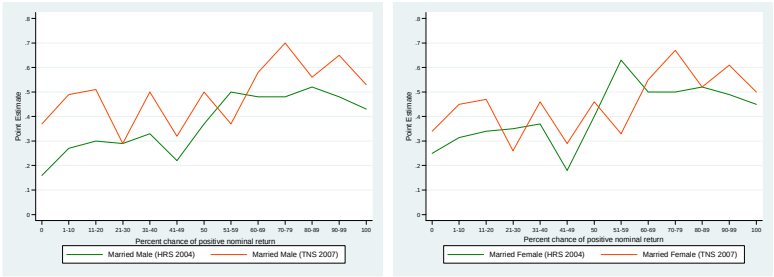
	Whole Sample		Respondents	
	Mean	Std. Dev.	Mean	Std. Dev.
Positive Nominal Return (PNR)	46.45	39.68	46.45	39.68
Past Positive Nominal Return (pPNR)	68.07	37.7	68.44	37.73
Risk Aversion (CARA)	39.11	3.58	39	3.77
Age	48	17	47	16
		% of the sample		
Account Management				
Self account management		51.5		52
Financial advisor or other		6.1		5.9
Gender				
Male		45.6		49.1
Female		54.4		50.9
Marital Status				
Married or living with a partner		63.2		66.6
Not married or living with a partner		36.8		33.4
Education				
High school or less		14.8		10.2
Less than college		62.2		62.3
College or more		23		27.5
Income Level				
Less than 8,000€		18.3		15.2
8,000€- 15,999€		32.1		28.8
16,000€- 29,999€		38.4		41.6
30,000€and over		11.2		14.4
Net Worth				
Less than 39,999€		21.3		23.3
40,000€- 149,999€		29.1		28.9
150,000€- 449,999€		30.4		24.2
450,000€and over		19.2		23.6
Stockholding		30.7		37.5
Firm shares in remuneration		4.7		5.6
Liquidity constraint		43.6		41.1
Online banking		19.7		24.5
No of observation		3,826		2,406

Source: TNS 2007. Standard errors are in brackets.

2.3 Further Data Validation:

Table 13 reports table 2 in Dominitz and Manski (2007) and our replication of their table using data from the TNS 2007 survey, for respondents in the same age bracket (50-80 years old):

Among the 50-80 year-olds, the probability of holding stocks is increasing in the percent chance of a positive Stock Market return, albeit in a more volatile way than in the US, since we have less observations:



The Probability of Holding Stocks Conditional on the Percent Chance of a Positive Nominal Return (PNR), Gender, and Marital Status. Source (left panel) Dominitz and Manski (2007) and (right panel) TNS 2007.

2.4 What determines Information (pPNR)?

Table 14 reports estimation results of a Tobit specification for answers to question qc9 in the TNS 2007 survey (censored below by '0' and above by '100'), as a function of age, sources of advice (friends, family, professional, broad media, specialised media) and information (TV, economics/finance emissions), own and parents' educational attainment, family background (middle/lower/other class), endowments (income and wealth), financial decision taking (no/partial/complete delegation of financial decisions), own past experience (number of stock market operations over the last year), preferences (risk aversion and impatience), constraints (online banking) and a measure of the relative importance of money in life (taste for financial management):

2.5 Elementary Theory

The standard two-risky asset model, in either its static (Arrow, 1965) or dynamic (Merton, 1969; Samuelson, 1969) version[16], predicts that a necessary and

[16] The dynamic (life-cycle) versions that produce a myopic (independent of the investment horizon) optimal share of wealth invested in risky assets, necessitate in addition, that log-returns are normally distributed, independent and identically distributed through time, and investors' preferences in the constant relative risk aversion (CRRA) class. See

Table 11: Comparing Dominitz and Manski's (2007) HRS 2004 with TNS 2007 for 50 ≤Age≤ 80

Percent chance of positive nominal return	Married or living with a partner: Male Point Estimate	Married or living with a partner: Male Standard Error	Married or living with a partner: Female Point Estimate	Married or living with a partner: Female Standard Error	*NOT* Married or living with a partner: Male Point Estimate	*NOT* Married or living with a partner: Male Standard Error	*NOT* Married or living with a partner: Female Point Estimate	*NOT* Married or living with a partner: Female Standard Error
0	0.16	(0.02)	0.25	(0.03)	0.08	(0.03)	0.08	(0.02)
1-10	0.27	(0.03)	0.31	(0.02)	0.16	(0.04)	0.20	(0.02)
11-20	0.30	(0.03)	0.34	(0.03)	0.16	(0.05)	0.14	(0.03)
21-30	0.29	(0.03)	0.35	(0.02)	0.19	(0.05)	0.23	(0.03)
31-40	0.33	(0.04)	0.37	(0.03)	0.16	(0.05)	0.18	(0.03)
41-49	0.22	(0.14)	0.18	(0.12)	0.50	(0.25)	0.33	(0.14)
50	0.37	(0.01)	0.40	(0.01)	0.25	(0.02)	0.25	(0.02)
51-59	0.50	(0.14)	0.63	(0.17)	0.20	(0.18)	0.20	(0.18)
60-69	0.48	(0.03)	0.50	(0.03)	0.30	(0.06)	0.31	(0.03)
70-79	0.48	(0.02)	0.50	(0.02)	0.38	(0.04)	0.41	(0.03)
80-89	0.52	(0.02)	0.52	(0.03)	0.42	(0.05)	0.30	(0.04)
90-99	0.48	(0.03)	0.49	(0.05)	0.24	(0.07)	0.43	(0.07)
100	0.43	(0.03)	0.45	(0.04)	0.25	(0.05)	0.23	(0.04)
All	0.40	(0.01)	0.40	(0.01)	0.25	(0.01)	0.24	(0.01)

Source: Dominitz and Manski (2007).

Percent chance of positive nominal return	Married or living with a partner: Male Point Estimate	Married or living with a partner: Male Standard Error	Married or living with a partner: Female Point Estimate	Married or living with a partner: Female Standard Error	*NOT* Married or living with a partner: Male Point Estimate	*NOT* Married or living with a partner: Male Standard Error	*NOT* Married or living with a partner: Female Point Estimate	*NOT* Married or living with a partner: Female Standard Error
0	0.37	(0.03)	0.34	(0.03)	0.33	(0.04)	0.30	(0.03)
1-10	0.49	(0.10)	0.45	(0.10)	0.44	(0.10)	0.40	(0.10)
11-20	0.51	(0.09)	0.47	(0.09)	0.46	(0.09)	0.42	(0.09)
21-30	0.29	(0.07)	0.26	(0.07)	0.24	(0.07)	0.22	(0.06)
31-40	0.50	(0.08)	0.46	(0.08)	0.44	(0.08)	0.41	(0.08)
41-49	0.32	(0.13)	0.29	(0.12)	0.28	(0.12)	0.25	(0.11)
50	0.50	(0.07)	0.46	(0.07)	0.45	(0.07)	0.41	(0.07)
51-59	0.37	(0.17)	0.33	(0.16)	0.32	(0.16)	0.29	(0.15)
60-69	0.58	(0.07)	0.55	(0.08)	0.53	(0.08)	0.50	(0.08)
70-79	0.70	(0.07)	0.67	(0.07)	0.65	(0.07)	0.62	(0.08)
80-89	0.56	(0.07)	0.52	(0.07)	0.51	(0.08)	0.48	(0.07)
90-99	0.65	(0.07)	0.61	(0.07)	0.60	(0.08)	0.56	(0.07)
100	0.53	(0.04)	0.50	(0.04)	0.48	(0.05)	0.45	(0.04)
All	0.47	(0.02)	0.44	(0.03)	0.43	(0.04)	0.41	(0.03)

Source: TNS 2007.

Table 12: Tobit Estimation of the Determinants of Information (pPNR); TNS 2007

	(1)	(2)	(3)	(4)	(5)
Age	1.179***	0.871***	0.852***	0.419	0.462
	(0.283)	(0.296)	(0.296)	(0.312)	(0.4)
Age squared	-0.00947***	-0.00656**	-0.00605**	-0.00243	-0.00285
	(0.00285)	(0.00296)	(0.00297)	(0.00307)	(0.00387)
Friends advice		4.645**	4.391**	4.142**	2.401
		(1.964)	(1.961)	(1.952)	(2.253)
Family advice		-6.176***	-6.137***	-5.985***	-3.761*
		(1.862)	(1.857)	(1.848)	(2.151)
Professional advice		0.275	0.207	-0.547	-0.2087
		(1.855)	(1.85)	(1.854)	(2.337)
Media advice		2.024	1.721	1.16	-2.012
		(2.303)	(2.3)	(2.291)	(2.605)
Specialised media advice		8.570***	8.157***	7.543***	4.633*
		(2.267)	(2.265)	(2.265)	(2.632)
Information from TV		-2.057	-1.755	-1.685	-1.589
		(2.05)	(2.047)	(2.037)	(2.485)
Information from economics emissions		-1.255	-0.842	-0.679	-0.1562
		(1.795)	(1.796)	(1.787)	(2.0785)
Education (Ref. category: High school or less)					
Less than college			3.317	1.291	0.2785
			(2.847)	(2.863)	(3.455)
College or more			8.324***	4.287	3.352
			(3.098)	(3.196)	(3.922)
Log (Income)				5.812***	5.585***
				(1.386)	(1.701)
Log (Net worth)				0.62	-0.1101
				(0.556)	(0.7284)
Account management (Ref. category: Other)					
Self account management					2.211
					(1.958)
Financial advisor					7.372*
					(4.296)
Past frequency of trades					6.229***
					(1.139)
Risk aversion (CARA)					-27.81
					(23.894)
Mother education (Ref. category: Less than secondary)					
Secondary					0.8705
					(3.777)
Higher than secondary					0.4947
					(3.629)
Father education (Ref. category: Less than secondary)					
Secondary					-0.1490
					(3.455)
Importance of money in life					-2.294***
					(0.578)
Family background (Ref. category: Neither)					
Middle class					-1.858
					(3.545)
Low class					1.957
					(2.401)
Temporal preference					-0.512
					(0.4494)
Online banking					1.236
					(2.285)
Optimism					-3.343*
					(1.956)
Constant	35.97***	42.96***	38.21***	-10.53	21.61
	(6.575)	(7.071)	(7.459)	(12.75)	(19.55)
Log-likelihood	-11356	-10857	-10852	-10841	-7323
No of observations	2,253	2,158	2,158	2,158	1,468

Note: (i) Standard errors are in parantheses. (ii) *** p<0.01, ** p<0.05, * p<0.1

sufficient condition for investing in the risky asset ($\alpha_i^* > 0$) is that its expected return, $\widetilde{r}$, exceeds the return of the riskless asset, r :

$$\max_{\alpha_i \in [0,w_i]} E^i \left\{ u_i[(1+r)w_i + (\widetilde{r} - r)\alpha_i] \right\}$$

$$\text{FOC(N\&S):} \qquad E^i\{(\widetilde{r} - r)u_i'[(1+r)w_i + (\widetilde{r} - r)\alpha_i^*]\} = 0$$

$$\text{Participation Condition:} \qquad E^i\widetilde{r} - r > 0$$

$$\text{Conditional Demand Equation:} \qquad \alpha_i^* \cong \frac{E^i\widetilde{r} - r}{A_u^i(w_i)\sigma_i^2}$$

where $E^i\{.\}$ denotes the subjective expectation of the decision maker i. Individuals are thus fully characterized by their preferences, u_i, initial holdings, w_i, and beliefs over the available investment opportunities rewarding time, r, and risk and time, $\widetilde{r}$. Conditional on the reward for bearing risk being positive ($E^i\widetilde{r} - r > 0$), investors then allocate more or less of their wealth to the risky asset (α_i^*) depending on how much do they distaste risk, represented by the absolute risk aversion coefficient, $A_u^i(w_i) \equiv -\frac{u_i''(w_i)}{u_i'(w_i)}$. Risk itself is summarized by the subjective variance of the risky asset return, σ_i^2.

In this work we are only interested in the participation condition. For an estimation of the demand for risky assets at both the intensive and extensive margins, see Arrondel et al. (2011).

Brandt (2008) for a detailed explosition.