# Subjective Stock Market Expectations and Portfolio Choice

## WORK IN PROGRESS

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  2. *Subjective Belief Elicitation and Household Finance*: Dominitz and Manski (2007, JEEA); Dominitz and Manski (2010, NBER wp); Hurd (2009, AR); Hurd, van Rooij and Winter (2009, wp), Kedzi and Willis

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- Facts we will focus in today:
  1. Age-portfolio profiles are hump-shaped at the extensive margin, but appear unrelated at the intensive one (almost increasing)
  2. Households' portfolios are either (i) missing or (ii) incomplete (non-participation puzzle), and (iii) poorly diversified. Today's consensus is that **information and transactions costs** are the most important quantitatively.

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5. Conclusions and Extensions

# What do We do (I):

## Main Point

- Static Arrow's (1965) Portfolio Choice Model:

$$\max_{\alpha \in [0, w_0]} E\left\{u[(1+r)w_0 + (\tilde{r} - r)\alpha]\right\}$$

$$\text{FOC(N\&S)} \quad : \quad E\{(\tilde{r} - r)u'[(1+r)w_0 + (\tilde{r} - r)\alpha^*]\} = 0$$

$$\text{Participation Condition:} \qquad E\tilde{r} - r > 0$$

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## TNS-2007 Survey

- A professional Survey Agency (TNS) was paid (ANR research funds) to administer a survey with questions on attitudes, preferences, expectations and socio-economic and demographic characteristics to a representative sample of 4,000 households. Respondents had to fill the questionnaire, and return it by the post in exchange of around €25 (*bons-d'achat*).
- A *small* sample with a *panel* dimension (798 households) 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)
- A complementary experimental module could *voluntarily* be filled on-line (400 individuals corresponding to 400 households), remunerated variably (€5,000 shared in prizes in the form of lotteries)

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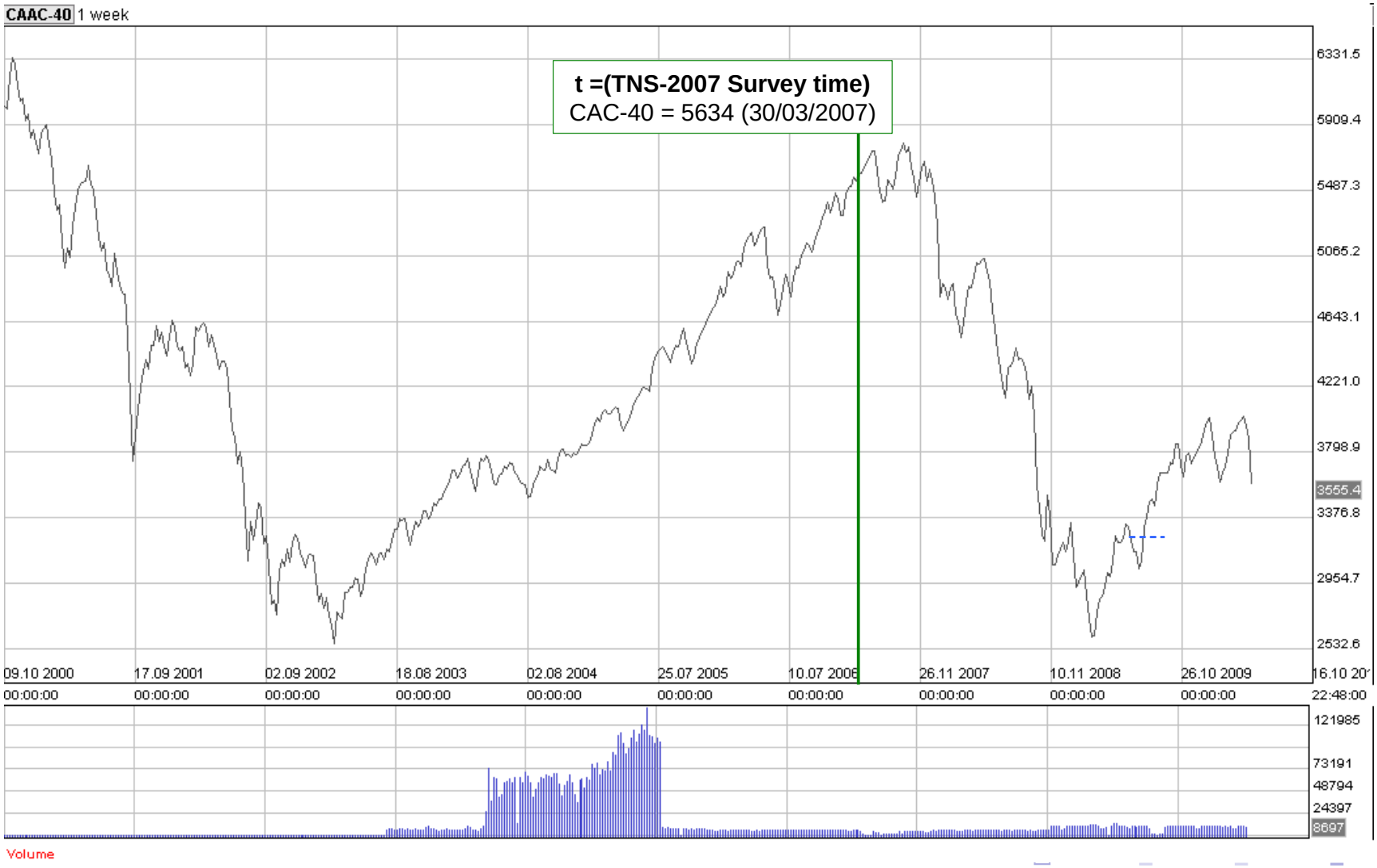
- We elicit households' subjective beliefs regarding the likely evolution of the French stock market index (CAC-40) 5 years ahead in time, $I_{t+5}$, relative to the time of the interview, $I_t$.

# What do We do (III)

## TNS-2007 Survey Time

French Stock Market Index CAC-40 between Oct2000 and Feb2010



# How do We do It (I)

## Probabilistic Questions about Expected Stock Market Performance 5 years ahead: (Translated) Wording

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 ($p_{ik}$). The sum of all your answers must be equal to 100 ($\sum_k p_{ik} = 100$)-:
$\{k = 1 : \tau \in (0.25, \tau^i_{\max}]\}$ -... will have increased by more than 25%
$\{k = 2 : \tau \in [0.10, 0.25]\}$-... will have increased by 10 to 25%
$\{k = 3 : \tau \in (0, 0.10)\}$-... will have increased by less than 10%
$\{k = 4 : \tau = 0\}$-... will be the same
$\{k = 5 : \tau \in (0, -0.10)\}$-... will have decreased by less than 10%
$\{k = 6 : \tau \in [-0.10, -0.25]\}$-... will have decreased by 10 to 25%
$\{k = 7 : \tau \in (-0.25, -\tau^i_{\min}]\}$-... will have decreased by more than 25%
C7b. 'If you expect the stock market to increase within the next 5 years, which is the highest possible increase (as a percentage)?' ($\tau^i_{\max}$)
C8b. 'In your opinion, if you expect the stock market to decrease within the next 5 years, which is the lowest possible decrease (as a percentage)?' ($\tau^i_{\min}$)

# How do We do It (II)

## Probabilistic Questions about Expected Stock Market Performance 5 years ahead:

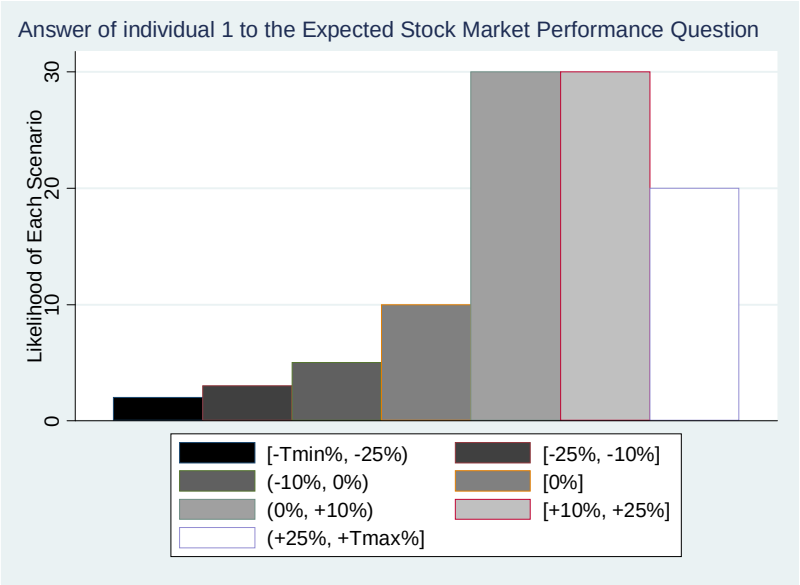
$I_t \equiv$Value of the CAC-40 Index by the time of the interview (March 2007, approx.)
$I_{t+5} \equiv$Value of the CAC-40 Index 5 years ahead of the time of the interview (March 2012, approx.)
We are inquiring about the subjective likelihood ($p_{ik}$) of different ranges ($k$) for the index percentage change ($\frac{I_{t+5}}{I_t} - 1 = \tau$),

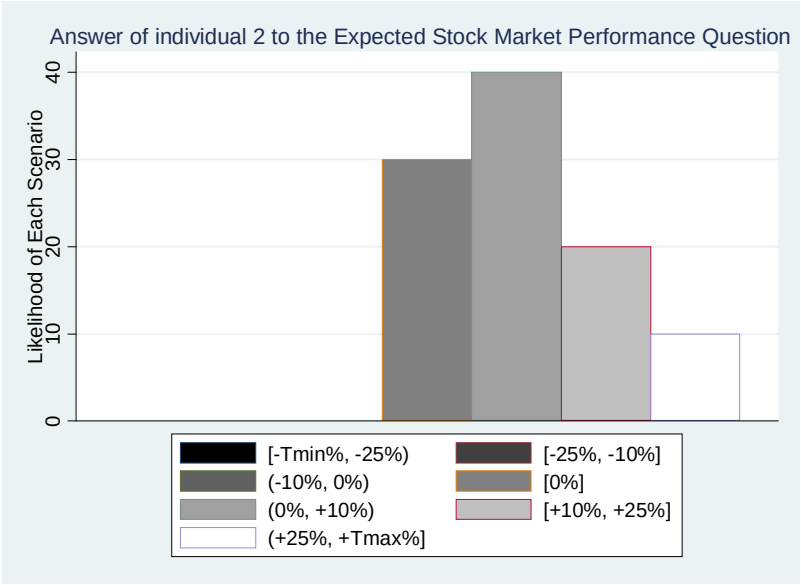
$$\forall i: \quad p_{ik} \equiv \Pr\left[\frac{I_{t+5}}{I_t} - 1 \in k \middle| i\right],$$

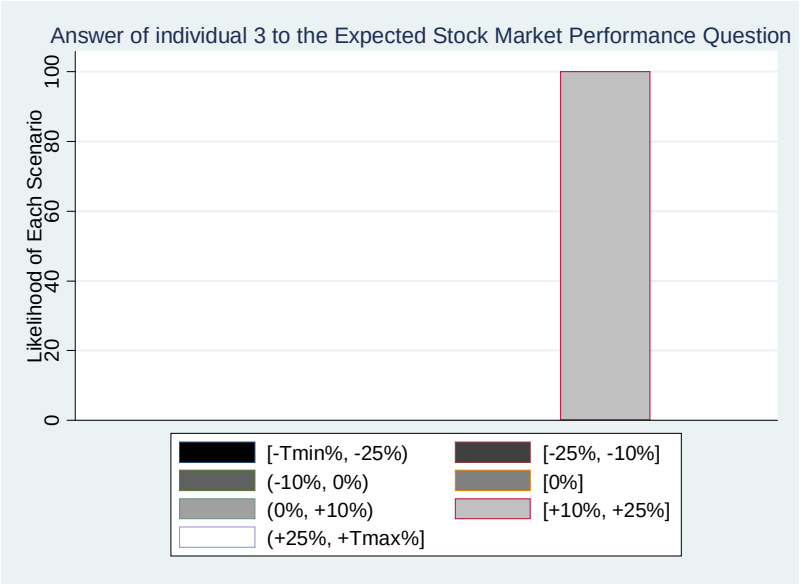
$$\text{Ranges } k = \begin{cases} 1 \text{ if } \tau \in (0.25, \tau^i_{\max}] \\ 2 \text{ if } \tau \in [0.10, 0.25] \\ 3 \text{ if } \tau \in (0, 0.10) \\ 4 \text{ if } \tau = 0 \\ 5 \text{ if } \tau \in (0, -0.10) \\ 6 \text{ if } \tau \in [-0.10, -0.25] \\ 7 \text{ if } \tau \in (-0.25, -\tau^i_{\min}] \end{cases}$$

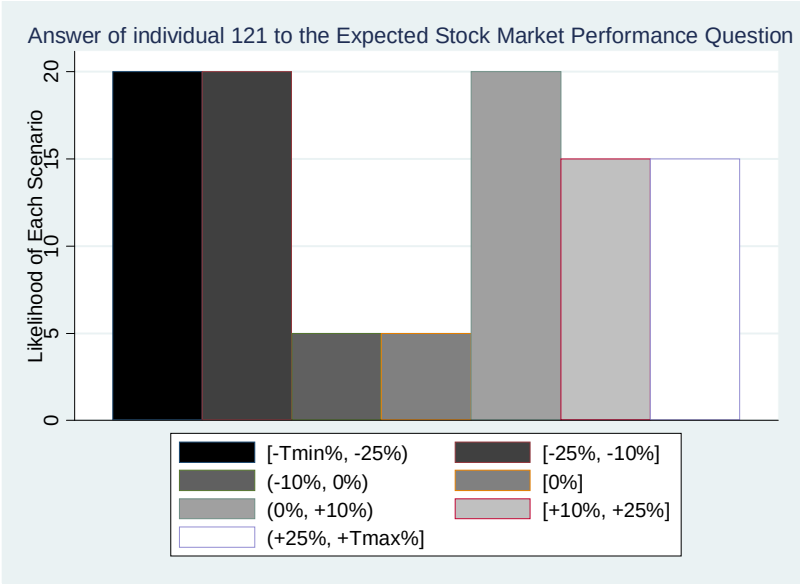
# How do They answer

## Probabilistic Questions about Expected Stock Market Performance 5 years ahead:



# Quality Matters (I)

## Comparison with the PNR variable in the 2004 Health and Retirement Survey (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?

$$\forall i: \quad F_{i0}^{DM} \equiv \Pr\left[\frac{I_{t+1}}{I_t} - 1 \in \cup_{k=1}^{3}\{k\} \middle| i\right]$$

988 TNS-2007 respondents, aged 50 to 80 in 2007, answered similarly:

$$\forall i: \quad F_{i0} \equiv \Pr\left[\frac{I_{t+5}}{I_t} - 1 \in \cup_{k=1}^{3}\{k\} \middle| i\right] = p_{i1} + p_{i2} + p_{i3}$$

# Quality Matters (I): Differences

## Probabilistic Questions about Expected Stock Market Performance 5 years ahead: Differences

1. Different Horizon (5 versus 1 year ahead) intended to reduce the sensibility of answers to: (i) *Bussiness cycle* conditions by the time of the interview (capture better historic trend in returns), and to (iii) *Inertia* in portfolio management (with *which* horizon do households invest in equity?): Less 50-50 type of answers.

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2. Different Elicitation Methodology: we elicit *pdf*s. (à la Guiso *et al.*, 1996) as opposed to *cdf*s. (à la Dominitz and Manski, 2007): Less above 100 points, less 50-50 type of answers.

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3. Representative sample by age: Study the relationship between age-portfolio profiles and subjective expectations
4. We *elicit individual information about past stock performance probabilistically* (Recent Stock Market Performance in the last 5 years; **past PNR**) intended to capture: (i) Differences in information across households, and (ii) The relationship between information and expectations.

# Quality Matters (II): Ages 50-80

## Comparison with the PNR variable in the 2004 Health and Retirement Survey (Dominitz and Manski, 2007), Ages 50-80

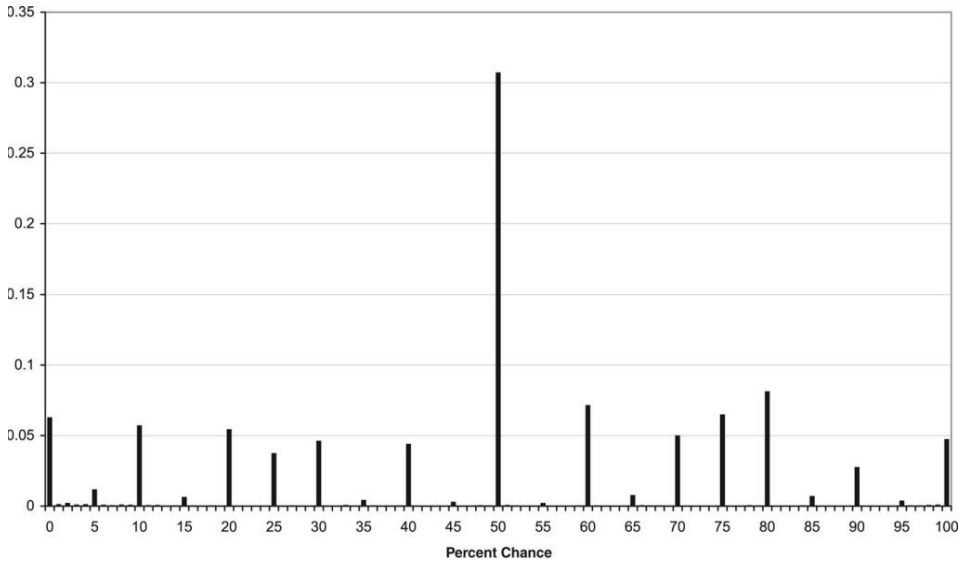


Figure 1. Percent chance of a positive nominal return, frequency distribution.

*Source*: Dominitz and Manski (2007, JEEA)

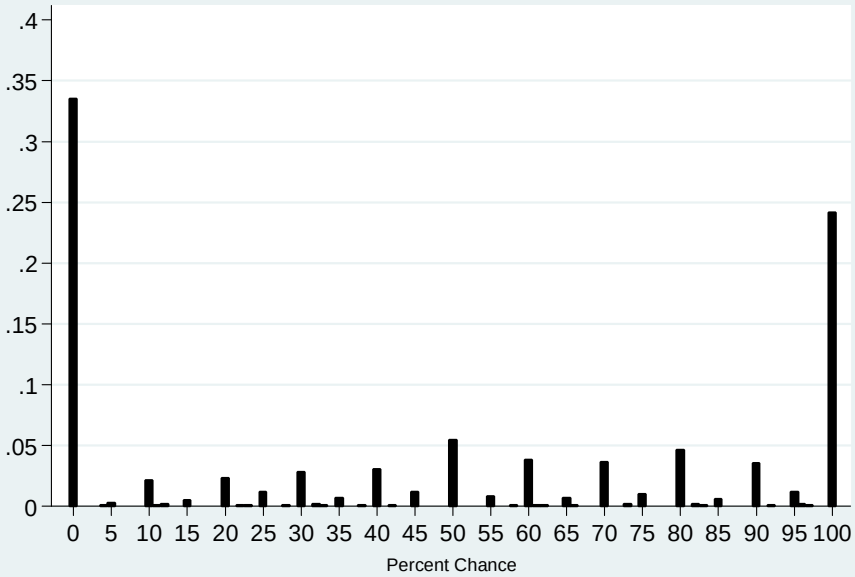


Figure 1b. Percent chance of positive nominal return (PNR) - age between 50-80

(Total Sample:1695, Selected Sample:988)

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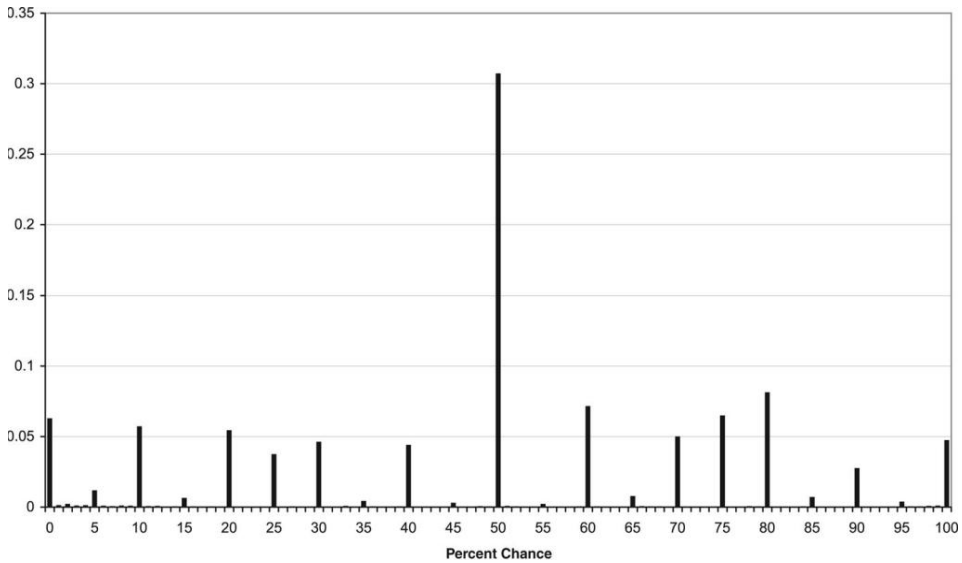


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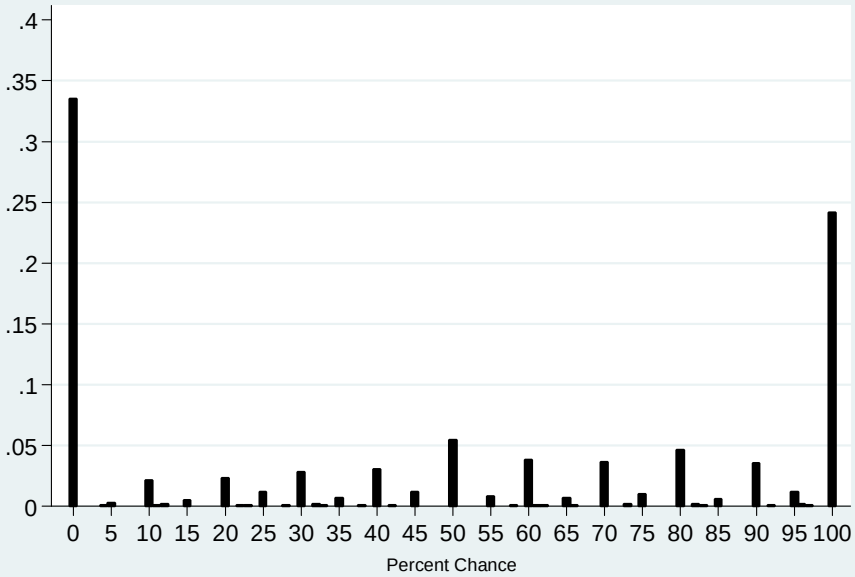


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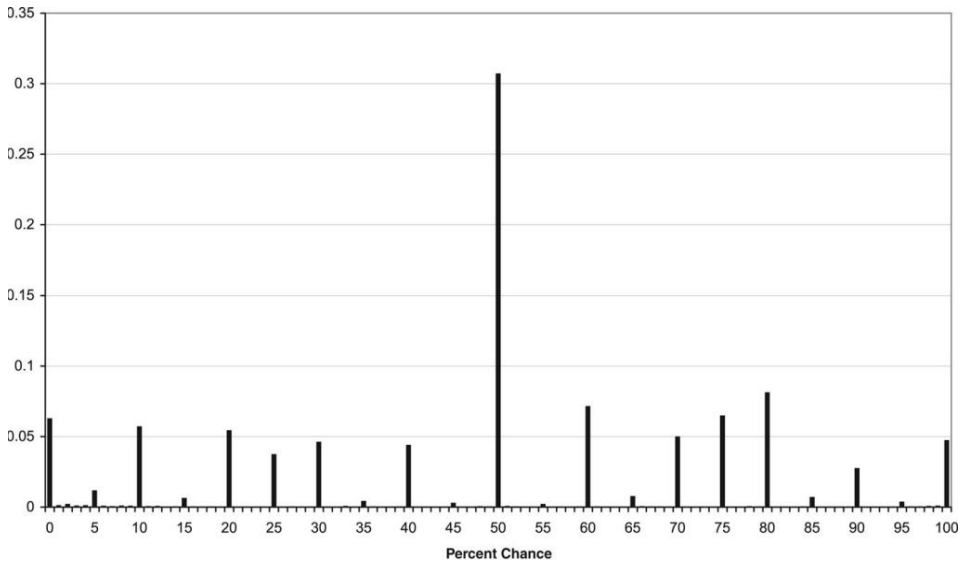


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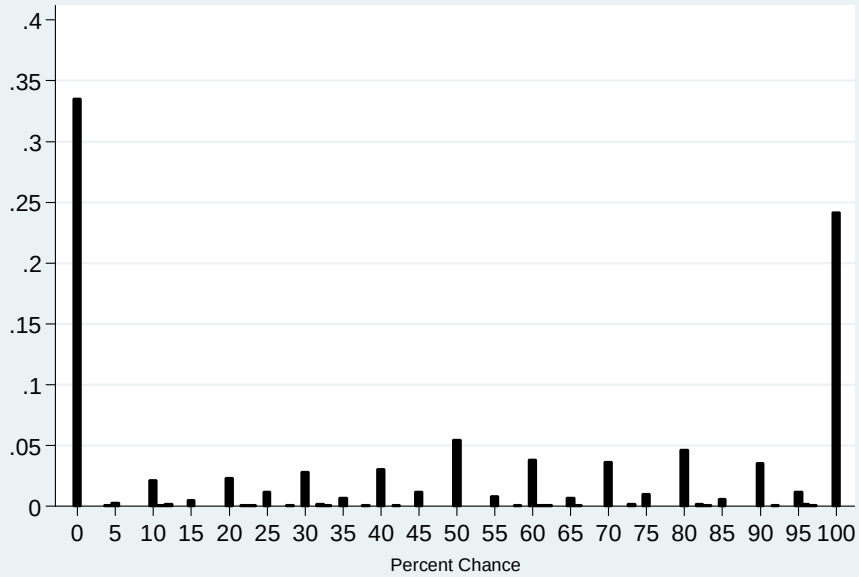


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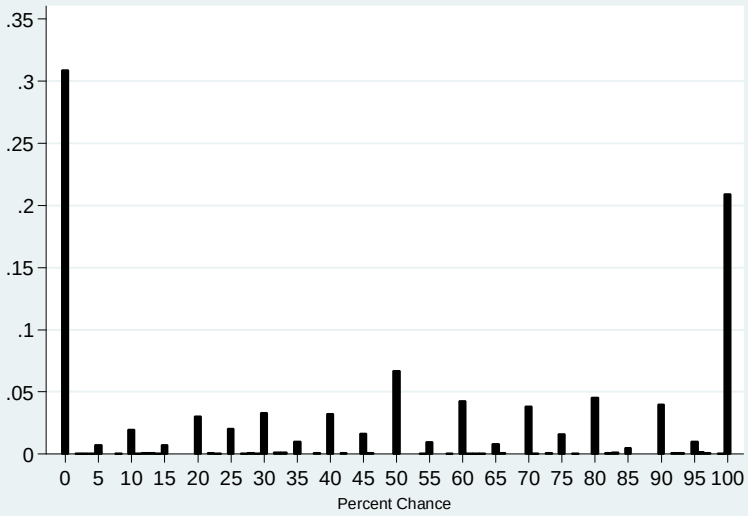
- But bunching is stronger in the {0,100} than in the {50}:
- Differences in elicitation method -pdf vs. cdf-, or differences in the time horizon of expected returns -5 vs. 1 year ahead-?

# Quality Matters (III): All Ages

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(Total Sample: 3826, Selected Sample: 2374)

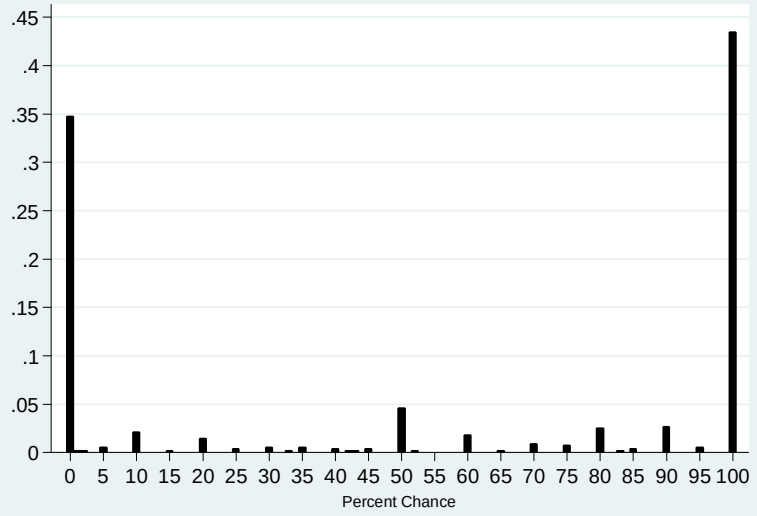



Figure 2. Percent chance of past positive nominal return (pPNR) conditional on PNR=0
(PNR=0 No. of observation: 678)

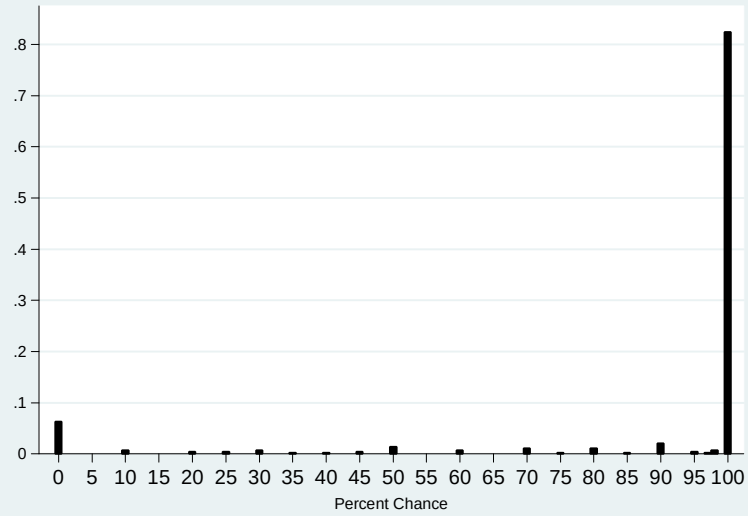
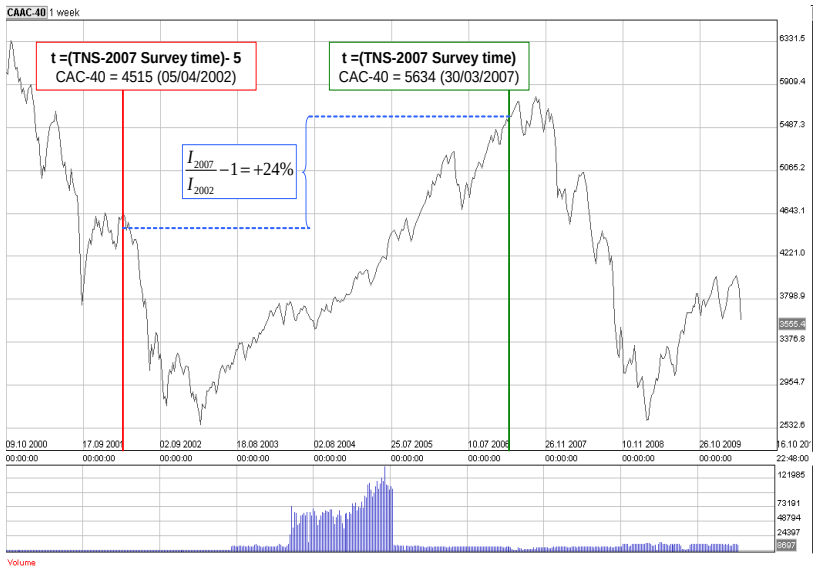
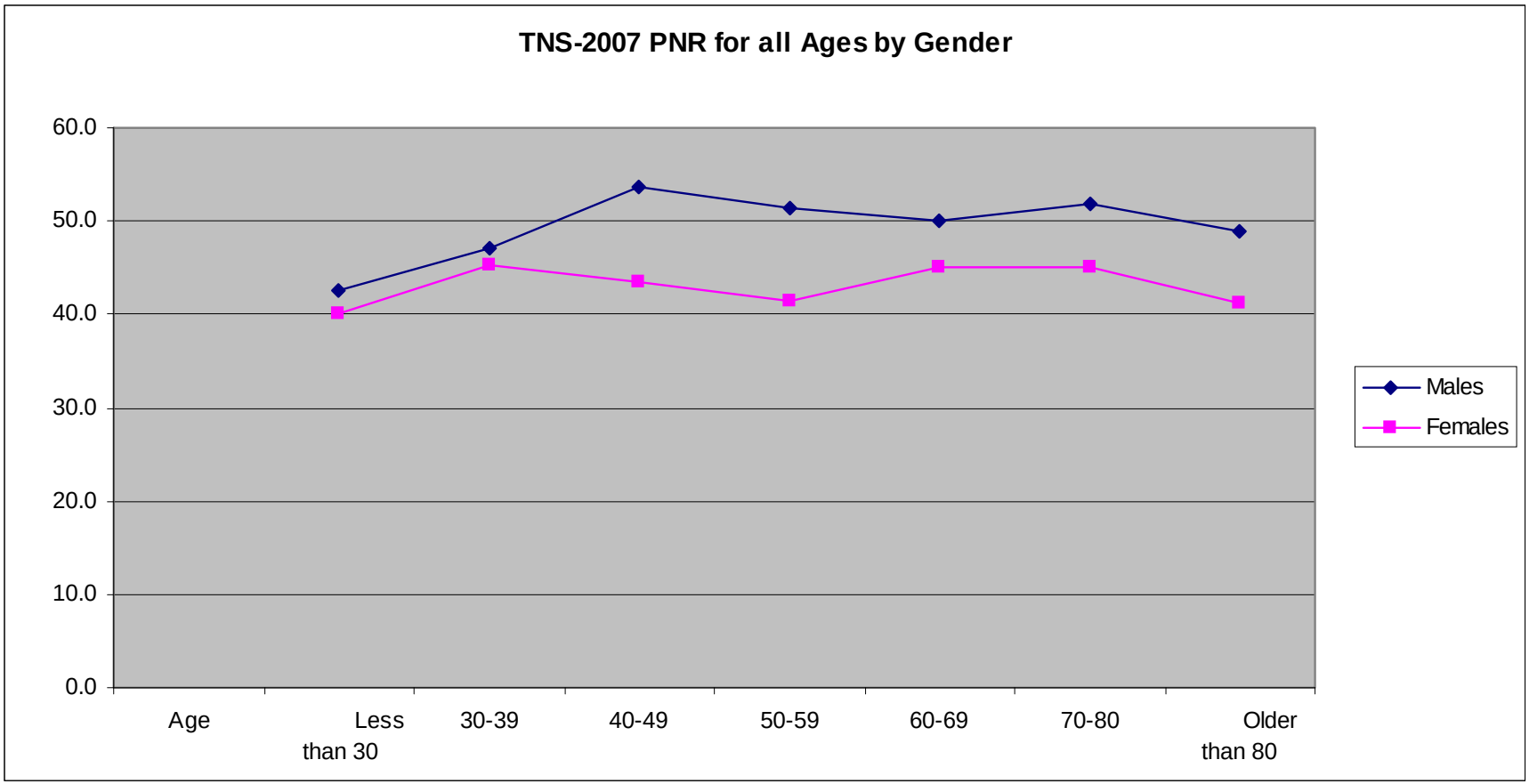



Figure 3. Percent chance of past positive nominal return (pPNR) conditional on PNR=100
(PNR=100 No. of observations: 483)

French Stock Market Index CAC-40 between Oct2000 and Feb2010

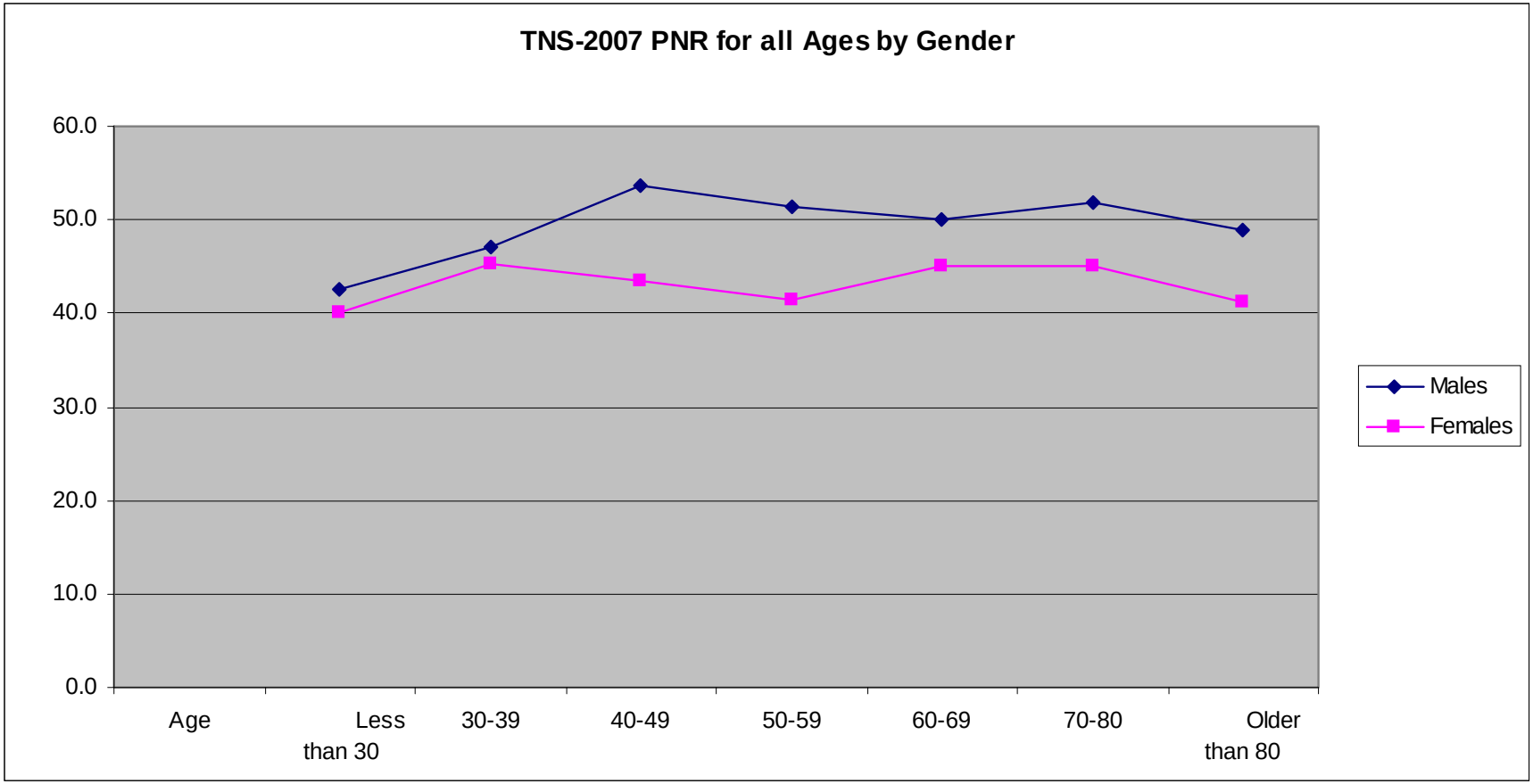


# PNR (TNS-2007) by Age and Gender




- Subjective Conditional Stock Market Expectations are *hump-shaped* over the life-cycle (alike participation)

# PNR (TNS-2007) by Age and Gender




- Subjective Conditional Stock Market Expectations are *hump-shaped* over the life-cycle (alike participation)
- (As in the US, males appear more optimistic than females)

# Quality Matters (IV)

TABLE 2. Probability of holding stocks or stock mutual funds conditional on percent chance of positive nominal return, gender, and marital status.

| Percent chance of positive nominal return | Married or living with a partner | | | | NOT married or living with a partner | | | |
|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | Male | | Female | |
| | Point estimate | Standard error | Point estimate | Standard error | Point estimate | Standard error | Point estimate | 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, JEEA)

**Table 3. Probability of holding stocks or stock mutual funds conditional on percent chance of positive nominal return, gender and marital status (age 50-80)**

| Percent chance of positive nominal return | Married or living with a partner | | | | NOT married or living with a partner | | | |
|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | Male | | Female | |
| | Point Estimate | Standard Error | Point Estimate | Standard Error | Point Estimate | Standard Error | Point Estimate | Standard Error |
| 0 | 0.37 | (0.03) | 0.35 | (0.03) | 0.32 | (0.04) | 0.30 | (0.03) |
| 1-10 | 0.52 | (0.10) | 0.49 | (0.10) | 0.46 | (0.10) | 0.44 | (0.10) |
| 11-20 | 0.51 | (0.09) | 0.48 | (0.09) | 0.45 | (0.10) | 0.42 | (0.09) |
| 21-30 | 0.25 | (0.07) | 0.24 | (0.06) | 0.21 | (0.07) | 0.19 | (0.06) |
| 31-40 | 0.48 | (0.08) | 0.45 | (0.08) | 0.42 | (0.08) | 0.39 | (0.08) |
| 41-49 | 0.26 | (0.13) | 0.24 | (0.12) | 0.22 | (0.12) | 0.20 | (0.11) |
| 50 | 0.50 | (0.07) | 0.47 | (0.07) | 0.44 | (0.07) | 0.41 | (0.07) |
| 51-59 | 0.36 | (0.16) | 0.34 | (0.16) | 0.31 | (0.16) | 0.29 | (0.15) |
| 60-69 | 0.60 | (0.07) | 0.57 | (0.08) | 0.54 | (0.08) | 0.51 | (0.08) |
| 70-79 | 0.70 | (0.07) | 0.68 | (0.07) | 0.64 | (0.07) | 0.62 | (0.08) |
| 80-89 | 0.55 | (0.07) | 0.52 | (0.07) | 0.50 | (0.08) | 0.47 | (0.07) |
| 90-99 | 0.66 | (0.07) | 0.63 | (0.07) | 0.60 | (0.08) | 0.57 | (0.08) |
| 100 | 0.53 | (0.04) | 0.50 | (0.04) | 0.48 | (0.05) | 0.45 | (0.04) |
| All | 0.47 | (0.02) | 0.45 | (0.03) | 0.42 | (0.04) | 0.40 | (0.03) |

- Among the 50-80 year-olds, the probability of holding stocks is increasing in the percent chance of positive Stock Market returns (PNR)

# Quality Matters (IV)

TABLE 2. Probability of holding stocks or stock mutual funds conditional on percent chance of positive nominal return, gender, and marital status.

| Percent chance of positive nominal return | Married or living with a partner | | | | NOT married or living with a partner | | | |
|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | Male | | Female | |
| | Point estimate | Standard error | Point estimate | Standard error | Point estimate | Standard error | Point estimate | 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, JEEA)

**Table 3. Probability of holding stocks or stock mutual funds conditional on percent chance of positive nominal return, gender and marital status (age 50-80)**

| Percent chance of positive nominal return | Married or living with a partner | | | | NOT married or living with a partner | | | |
|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | Male | | Female | |
| | Point Estimate | Standard Error | Point Estimate | Standard Error | Point Estimate | Standard Error | Point Estimate | Standard Error |
| 0 | 0.37 | (0.03) | 0.35 | (0.03) | 0.32 | (0.04) | 0.30 | (0.03) |
| 1-10 | 0.52 | (0.10) | 0.49 | (0.10) | 0.46 | (0.10) | 0.44 | (0.10) |
| 11-20 | 0.51 | (0.09) | 0.48 | (0.09) | 0.45 | (0.10) | 0.42 | (0.09) |
| 21-30 | 0.25 | (0.07) | 0.24 | (0.06) | 0.21 | (0.07) | 0.19 | (0.06) |
| 31-40 | 0.48 | (0.08) | 0.45 | (0.08) | 0.42 | (0.08) | 0.39 | (0.08) |
| 41-49 | 0.26 | (0.13) | 0.24 | (0.12) | 0.22 | (0.12) | 0.20 | (0.11) |
| 50 | 0.50 | (0.07) | 0.47 | (0.07) | 0.44 | (0.07) | 0.41 | (0.07) |
| 51-59 | 0.36 | (0.16) | 0.34 | (0.16) | 0.31 | (0.16) | 0.29 | (0.15) |
| 60-69 | 0.60 | (0.07) | 0.57 | (0.08) | 0.54 | (0.08) | 0.51 | (0.08) |
| 70-79 | 0.70 | (0.07) | 0.68 | (0.07) | 0.64 | (0.07) | 0.62 | (0.08) |
| 80-89 | 0.55 | (0.07) | 0.52 | (0.07) | 0.50 | (0.08) | 0.47 | (0.07) |
| 90-99 | 0.66 | (0.07) | 0.63 | (0.07) | 0.60 | (0.08) | 0.57 | (0.08) |
| 100 | 0.53 | (0.04) | 0.50 | (0.04) | 0.48 | (0.05) | 0.45 | (0.04) |
| All | 0.47 | (0.02) | 0.45 | (0.03) | 0.42 | (0.04) | 0.40 | (0.03) |

- Among the 50-80 year-olds, the probability of holding stocks is increasing in the percent chance of positive Stock Market returns (PNR)
- (*Albeit* in a more volatile way than in the US, since we have less observations)

# Quality Matters (V)

Table 6: Probability of holding stocks directly or indirectly

| Probit | 50<=Age<=80 | | | | | All ages | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| Positive nominal return (PNR) | 0.005*** | 0.005*** | 0.005*** | 0.005*** | 0.004*** | 0.005*** | 0.005*** | 0.004*** | 0.004*** | 0.003*** |
| | (001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Gender (Male=1) | 0.041 | 0.037 | 0.002 | 0.084 | -0.025 | 0.05 | 0.034 | -0.014 | 0.049 | -0.028 |
| | (0.083) | (0.084) | (0.092) | (0.103) | (0.118) | (0.053) | (0.054) | (0.059) | (0.065) | (0.071) |
| Married/living with a partner | 0.112 | 0.099 | 0.155 | 0.065 | 0.056 | 0.172*** | 0.114* | 0.166*** | 0.089 | 0.032 |
| | (0.091) | (0.092) | (0.101) | (0.115) | (0.131) | (0.057) | (0.059) | (0.064) | (0.072) | (0.079) |
| Age | | 0.241*** | 0.184** | 0.235** | 0.212* | | 0.029*** | 0.015 | 0.026* | 0.029** |
| | - | (0.083) | (0.089) | (0.099) | (0.112) | - | (0.010) | (0.011) | (0.013) | (0.014) |
| Age squared | | -0.002*** | -0.001* | -0.002** | -0.002* | | -0.000 | -0.000 | -0.000 | -0.000 |
| | - | (0.001) | (0.001) | (0.001) | (0.001) | - | (0.000) | (0.000) | (0.000) | (0.000) |
| Past positive nominal return | | | 0.001 | 0.001 | 0.001 | | | 0.003*** | 0.003*** | 0.002 |
| | - | - | (0.001) | (0.001) | (0.002) | - | - | (0.001) | (0.001) | (0.001) |
| Self management (MNGa) | | | | -0.332*** | -0.324*** | | | | -0.231*** | -0.206*** |
| | - | - | - | (0.101) | (0.115) | - | - | - | (0.066) | (0.073) |
| Financial advisor (MNGf) | | | | 1.044*** | 1.24*** | | | | 0.499*** | 0.467*** |
| | - | - | - | (0.301) | (0.346) | - | - | - | (0.149) | (0.160) |
| Firm shares in remuneration | | | | | -0.35 | | | | | -0.060 |
| | - | - | - | - | (0.285) | - | - | - | - | (0.144) |
| Liquidity constrained | | | | | -1.137*** | | | | | -1.044*** |
| | - | - | - | - | (0.139) | - | - | - | - | (0.083) |
| Risk aversion (CARA) | | | | | -0.831*** | | | | | -0.611*** |
| | - | - | - | - | (0.139) | - | - | - | - | (0.090) |
| Poorly informed/Not trustworthy | | | | | -0.974*** | | | | | -0.699*** |
| | - | - | - | - | (0.147) | - | - | - | - | (0.085) |
| Transaction costs | | | | | -0.126 | | | | | -0.238 |
| | - | - | - | - | (0.137) | - | - | - | - | (0.152) |
| On-line banking | | | | | 0.424*** | | | | | 0.369*** |
| | - | - | - | - | (0.145) | - | - | - | - | (0.080) |
| Constant | -0.477*** | -8.219*** | -6.571** | -7.622** | -6.181* | -0.706*** | -1.607*** | -1.447*** | -1.322*** | -0.755** |
| | (0.089) | (2.586) | (2.778) | (3.076) | (3.484) | (0.060) | (0.239) | (0.259) | (0.299) | (0.332) |
| Pseudo R2 | 0.022 | 0.03 | 0.032 | 0.062 | 0.283 | 0.023 | 0.042 | 0.048 | 0.057 | 0.232 |
| chi2 | 30.11 | 40.464 | 36.584 | 58.531 | 265.539 | 72.423 | 130.419 | 131.264 | 126.997 | 518.822 |
| Log likelihood | -663.86 | -658.592 | -558.632 | -440.499 | -336.995 | -1533.186 | -1504.188 | -1297.931 | -1056.17 | -860.257 |
| No of observations | 988 | 988 | 834 | 685 | 685 | 2374 | 2374 | 2033 | 1617 | 1617 |

# Does It work?

- Sample selection econometric specification:

$$
\begin{aligned}
Stocks &= 1\{\mathbf{x}\delta + v > 0\} && \text{(Participation)} \\
\tfrac{Stocks}{F} &= \mathbf{x}_1\boldsymbol{\beta}_1 + u && \text{(Conditional demand)} \\
v &\sim N(0,1) && \text{(Probit)} \\
E(u|v) &= \eta v && \text{(Linearity)}
\end{aligned}
$$

$$
\begin{aligned}
\mathbf{x}_1 = \quad & \{\text{Expected Return (ER), Std. Dev. of ER, CARA;} \\
& \text{Temporal Preference, Past Return (PR), Std. Dev. of PR}\} \\
\mathbf{x} = \quad & \{\mathbf{x}_1; \text{Total Net Worth, Income, Age, Education, MNG, Information}\}
\end{aligned}
$$

Table X: The Demand for Risky Assets

| Variables | (1) | (2) | (3) |
|---|---|---|---|
| CARA | -0.377* | -0.417** | -0.389** |
| If CARA>0 | 18.526** | 19.285** | 18.146** |
| Temporal Preference | -0.570 | -0.578* | -0.562* |
| Expected Return (ER) | 11.242 | 12.448* | 5.842 |
| StdDev of ER | -28.870** | -24.982** | -18.276 |
| Past Return (PR) | | | 14.493** |
| StdDev of PR | | | -15.570 |
| If PR>0 | | | -0.211 |
| constant | 31.094*** | 31.379*** | 29.938*** |
| Income | 19.269*** | 18.957*** | 18.346*** |
| Income Squared | -144.775** | -125.043** | -122.617** |
| Total Wealth | 0.798*** | 0.749*** | 0.748*** |
| Total Wealth Squared | -0.034*** | -0.031*** | -0.032*** |
| Age | 0.236* | 0.191* | 0.183* |
| Age squared | -0.015 | -0.010 | -0.009 |
| *Inter vivos* transfers | 0.192*** | 0.188*** | 0.180*** |
| High-school | 0.519*** | 0.440*** | 0.423*** |
| Technical/Professional | 0.201 | 0.175 | 0.163 |
| Some college or more | 0.219 | 0.169 | 0.152 |
| Paris | 0.063 | 0.066 | 0.068 |
| Homeownership | 0.013 | 0.093 | 0.097 |
| If children>0 | -0.045 | -0.051 | -0.050 |
| Parents own risky assets | 0.409*** | 0.409*** | 0.402*** |
| On-line banking | 0.201*** | 0.202*** | 0.191*** |
| Liquidity Constrained | -0.589* | -0.675** | -0.672** |
| Firm shares in remuneration | 0.561*** | 0.535*** | 0.533*** |
| CARA | -0.008 | -0.008 | -0.007 |
| If CARA>0 | 0.203 | 0.320 | 0.274 |
| Temporal Preference | 0.021* | 0.016 | 0.016 |
| Expected Return (ER) | 1.098*** | 1.074*** | 0.919*** |
| If ER>0 | (omitted) | 0.187*** | 0.078 |
| Past Return (PR) | | | 0.305 |
| StdDev of PR | | | 0.208 |
| If PR>0 | | | 0.126 |
| constant | -2.050*** | -2.241*** | -2.202*** |
| LR test (chi2_c for rho=0) | 3.153 | 4.676 | 2.620 |
| p_value | 0.076 | 0.031 | 0.105 |
| Wald chi2 | 15.690 | 17.119 | 24.912 |
| p_value | 0.008 | 0.004 | 0.004 |
| Log likelihood | -5508.275 | -6689.124 | -6681.510 |
| No. of observations | 2042 | 2638 | 2638 |

*p<0.1; **p<0.05; ***p<0.01

# Conclusions

Elicited subjective stock market expectations:

- Can explain age-portfolio profiles (beyond Dominitz and Manski, 2007),

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- Determine stock market participation and conditional asset demands (better than Hurd *et al.*,2009, but still short of Kedzi and Willis, 2009),

# Conclusions

Elicited subjective stock market expectations:

- Can explain age-portfolio profiles (beyond Dominitz and Manski, 2007),
- Determine stock market participation and conditional asset demands (better than Hurd *et al.*,2009, but still short of Kedzi and Willis, 2009),
- Can explain the portfolio non-participation puzzle? (*Reverse causality*: those who hold stocks are also more likely to be better informed)

# Extensions (I)

- Dissect the variable Past Stock Market Performance

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- Model (i) measurement error in responses and (ii) expectations formation using Past Stock Market Performance (Kedzi and Willis, 2009 wp)

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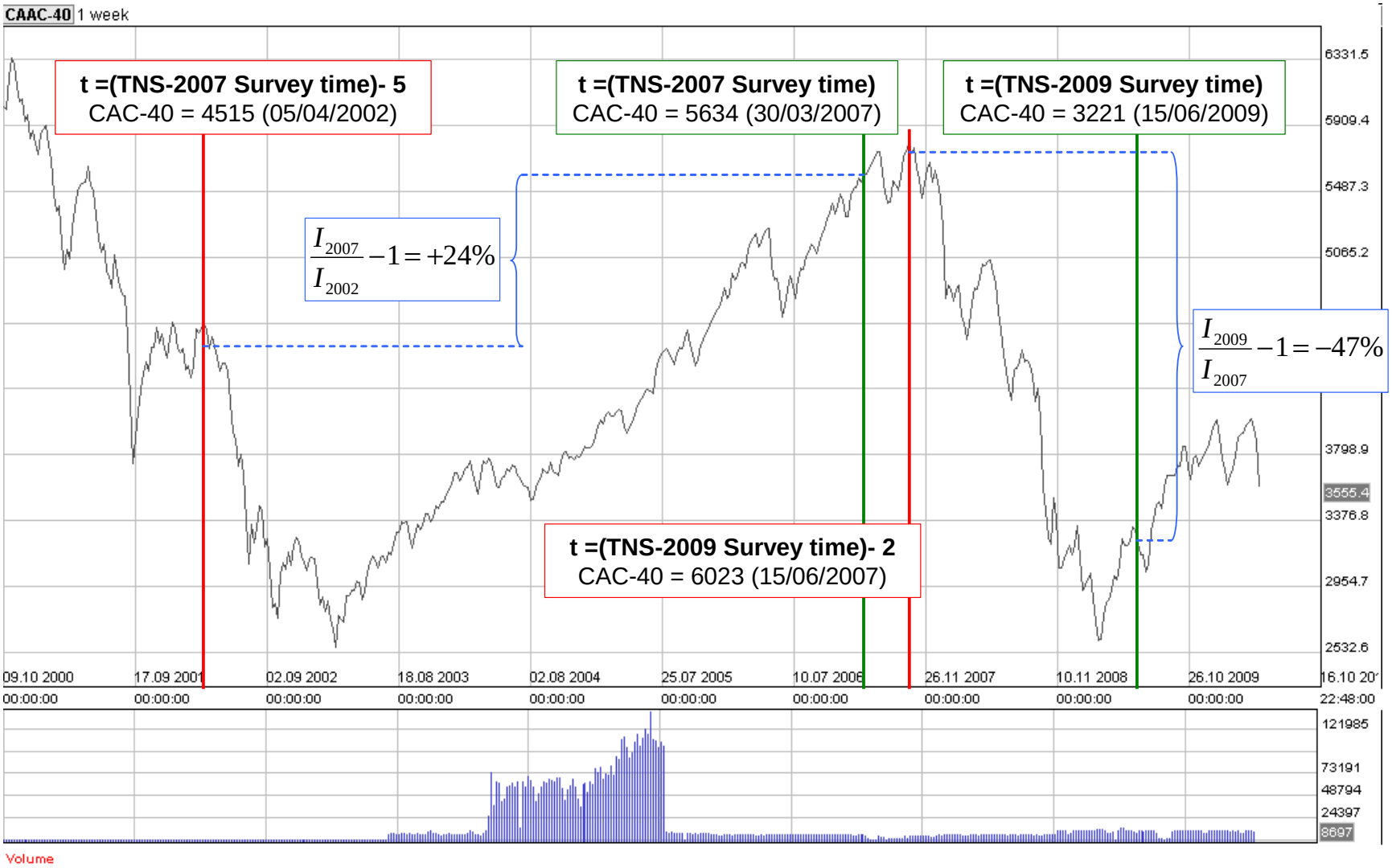
- [So far the median coefficient of relative risk aversion is around 80... for 561 observations!]
- And...

# Extensions (II)

French Stock Market Index CAC-40 between Oct2000 and Feb2010



# Appendix 1: Measured Absolute Risk Aversion (Guiso and Paiella, 2008 JEEA)

Wording: 'If someone suggests that you invest in a security ($\widetilde{S}_i$) promising one chance out of two to earn 5000 euros and one chance out of two of losing the capital invested, how much (as a maximum) are you willing to invest?'.

$$\begin{aligned} u^i(w_i) &= \frac{1}{2}u^i(w_i + 5,000) + \frac{1}{2}u^i(w_i - Z_i) = Eu^i(w_i + \widetilde{S}_i) \\ A_i(w_i) &= 2\frac{5000 - Z_i}{5000^2 + Z_i^2} \end{aligned}$$

$A_i$ is the absolute risk aversion coefficient (CARA)
$Z_i$ is the amount that the individual declares to be willing to invest.
Risk-averse: $Z_i < 5000$, risk-neutral: $Z_i = 5000$, risk-lovers: $Z_i > 5000$.
Range: $[0, 40]$; Histogram very skewed to the left.
For those who answered it (If CARA>0: 3,343 respondents), mean = 39.11

# Appendix 2: Descriptive Statistics: TNS-2007 PNR for all ages

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

| | Male | | | | | | | Female | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Quantile | | | | | | | Quantile | | | |
| Attribute | Number of respondents to PNR | Mean | Standard Deviation | 0.25 | 0.50 | 0.75 | Rate of response to PNR | Number of respondents to PNR | Mean | Standard Deviation | 0.25 | 0.50 | 0.75 | Rate of response to PNR |
| All Respondents | 1,169 | 49.7 | 40.2 | 0 | 50 | 95 | 0.67 | 1,205 | 43.2 | 39.1 | 0 | 40 | 80 | 0.58 |
| Married or living with a partner | | | | | | | | | | | | | | |
| No | 322 | 48.7 | 38.2 | 0 | 50 | 90 | 0.64 | 471 | 42.6 | 38.9 | 0 | 40 | 80 | 0.52 |
| Yes | 847 | 50.1 | 40.9 | 0 | 50 | 97 | 0.68 | 734 | 43.7 | 39.2 | 0 | 40 | 83 | 0.62 |
| Age | | | | | | | | | | | | | | |
| Less than 30 | 150 | 42.6 | 36.4 | 0 | 38 | 70 | 0.64 | 193 | 40.1 | 37.1 | 0 | 35 | 75 | 0.62 |
| 30-39 | 242 | 47.2 | 38.3 | 0 | 50 | 80 | 0.72 | 280 | 45.4 | 38.5 | 0 | 45 | 80 | 0.67 |
| 40-49 | 252 | 53.7 | 40.2 | 0 | 60 | 100 | 0.69 | 236 | 43.5 | 39.0 | 0 | 40 | 82 | 0.62 |
| 50-59 | 240 | 51.4 | 41.1 | 0 | 58 | 100 | 0.69 | 243 | 41.5 | 39.2 | 0 | 40 | 80 | 0.60 |
| 60-69 | 166 | 50.1 | 42.8 | 0 | 55 | 100 | 0.66 | 145 | 45.0 | 40.1 | 0 | 45 | 90 | 0.53 |
| 70-80 | 106 | 51.9 | 42.7 | 0 | 58 | 100 | 0.58 | 88 | 45.1 | 44.1 | 0 | 35 | 100 | 0.38 |
| Older than 80 | 13 | 48.9 | 40.4 | 0 | 50 | 90 | 0.50 | 20 | 41.3 | 39.6 | 0 | 43 | 70 | 0.33 |
| Holds stocks or mutual funds | | | | | | | | | | | | | | |
| No | 709 | 44.0 | 40.2 | 0 | 40 | 90 | 0.61 | 777 | 39.2 | 38.8 | 0 | 30 | 75 | 0.52 |
| Yes | 460 | 58.6 | 38.6 | 20 | 70 | 100 | 0.78 | 428 | 50.5 | 38.6 | 5 | 50 | 90 | 0.73 |

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

# Appendix 3: Descriptive Statistics: Probabilistic Questions about Stock Market Performance

**Descriptive Statistics**

| 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 |

# Appendix 4: Kedzi and Willis, 2009 wp (I)

They exploit the 55-65 year-old sample of the HRS 2002 ($N = 3642$).
Structural Model:

$$\left.\begin{array}{c} \widetilde{R}_{i(t+1)j} = \underbrace{\mu_{it} + \eta_{it}}_{\equiv R_{i(t+1)}} + \underbrace{\nu_{itj}}_{\text{Classical Measurement Error}} \\ \eta_{it} \left| \mu_{it} \sim i.i.d.N(0, \sigma_i^2) \right. \\ \nu_{itj} \left| (\mu_{it}, \eta_{it}) \sim i.i.d.N(0, \sigma_{\nu j}^2), j = \{0, 0', 10, 10'\} \right. \\ p_{ij}^* = \Pr(\widetilde{R}_{ij} > \tau_j \Big| \mu_i, \nu_{ij}) = \Phi\left(\frac{\mu_i + \nu_{ij} - \tau_j}{\sigma_i}\right), \tau_j = \{0, 0', .1, .1'\} \end{array}\right\} \Longrightarrow \text{CRRA}$$

# Appendix 4: Kedzi and Willis, 2009 wp (II)

[55-65 year-old sample of the HRS 2002 ($N = 3642$)]. Structural Model (*continued*):

$$\overset{\text{CRRA}}{\Longrightarrow} \begin{cases} \alpha_i^* = \beta_\alpha' x_i + \mathbf{T}\frac{\mu_i - r}{\sigma_i^2} + u_{\alpha i} \\ \mu_i = \beta_\mu' x_i + \gamma_\mu' z_{\mu i} + u_{\mu i} \\ \log(\sigma_i) = \beta_\sigma' x_i + \gamma_\sigma' z_{\sigma i} \end{cases}$$

$x_i \equiv$ [Demographics, Education, Cognitive Ability, Wealth]

$z_{\mu i} \equiv$ [Weather,Economic and Psychologic Optimism;Past Level DJIA]

$z_{\sigma i} \equiv$ [Fraction of 50-50 answers to probability Qs 92-02 except $p_0, p_{10}$]

- Results: Estimated coefficient $\mathbf{T} > 0$ statistically significant AND **small**, i.e. CRRA parameter around 3 (55-65 year-olds)

# Appendix 5: Hurd et al., 2009 wp (I)

They exploit the 2004 and 2006 waves of the Dutch CentER Panel ($N = 2000$). Model:

$$\left.\begin{array}{c} \ln \underbrace{\frac{I_{t+T}}{I_t}}_{\equiv R_{(t+T)}} = T\mu + \sum_{t=0}^{T} \eta_t \\ \eta_t \sim i.i.d.N(0, \sigma_\eta^2) \\ p_{ij}^* = \Pr(\ln R_{i(t+T)j} > \ln \tau_j \Big| \mu_i) = \Phi\left(\frac{T\mu_i - \ln \tau_j}{\sqrt{T}\sigma_i}\right) \\ \tau_j = \{\underbrace{0.7, 0.8, 0.9, 1.0}_{\text{Losses}}; \underbrace{1.0, 1.1, 1.2, 1.3}_{\text{Gains}}\} \end{array}\right\} \Longrightarrow$$

# Appendix 5: Hurd et al., 2009 wp (II)

[2004 and 2006 waves of the Dutch CentER Panel ($N = 2000$)]. Model (*continued*):

$$\Longrightarrow \begin{cases} Stocks = 1\{\beta_p' x_i + \mathrm{T}_\mu \mu_i + \mathrm{T}_\sigma \sigma_i^2 + u_{pi} > 0\} & \text{(Participation)} \\ \mu_i = \beta_\mu' x_i + \gamma_\mu' z_i + u_{\mu i} \\ \sigma_i = \beta_\sigma' x_i + \gamma_\sigma' z_i + u_{\sigma i} \end{cases}$$

$x_i \equiv$ [Demographics, Education, Income;Trust, Risk Av., Optimism, Late Resp.]

$z_i \equiv$ [S-M Activity, Follows S-M; Mean Historical Returns]

- Results: Estimated coefficients $\widehat{T}_\mu > 0$, $\widehat{T}_\sigma < 0$ statistically significant and important quantitatively

# Appendix 5: Hurd et al., 2009 wp (II)

[2004 and 2006 waves of the Dutch CentER Panel ($N = 2000$)]. Model (*continued*):

$$\Longrightarrow \begin{cases} Stocks = 1\{\beta_p' x_i + \mathrm{T}_\mu \mu_i + \mathrm{T}_\sigma \sigma_i^2 + u_{pi} > 0\} & \text{(Participation)} \\ \mu_i = \beta_\mu' x_i + \gamma_\mu' z_i + u_{\mu i} \\ \sigma_i = \beta_\sigma' x_i + \gamma_\sigma' z_i + u_{\sigma i} \end{cases}$$

$x_i \equiv$ [Demographics, Education, Income;Trust, Risk Av., Optimism, Late Resp.]

$z_i \equiv$ [S-M Activity, Follows S-M; Mean Historical Returns]

- Results: Estimated coefficients $\widehat{T}_\mu > 0$, $\widehat{T}_\sigma < 0$ statistically significant and important quantitatively
- Problems: $\widehat{T}_\sigma \simeq 0$ (only the expected return affects the extensive margin), No instrumentation for reverse causality...