

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

Preliminary

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Economics workshop, UoS

October 11th, 2011

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- Study Households' Subjective Beliefs: Does what they believe in explain their decision to invest? *Subjective Belief Elicitation*
- Study Households' Information: Does what they believe in explain their decision to invest, *given what they know?* *Information Elicitation*

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 - ③ Subjective Belief Elicitation and Household Finance: Dominitz and Manski (2007); Dominitz and Manski (2011); Hurd (2009); Hurd, van Rooij and Winter (2011), Kedzi and Willis (2009)

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- 5 Conclusions and Extensions

Why Should (Subjective) Expectations Matter? (I)

Main Point

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

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

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

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

$$\text{Conditional Demand Equation: } \alpha^* \cong \frac{E\tilde{r} - r}{A_u(w_0)\sigma_r^2}$$

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- *Main Point*: Replace $E\{.\}$ by $E^i\{.\}$ everywhere above (it is all about **information**)
- **N.B.** Samuelson (1969) (Merton, 1969): i.i.d. normality of Log Expected Returns, and CRRA preferences yields a similar conditional asset demand in a dynamic (continuous) time infinite horizon setup.

What do We do (II)

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*).

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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 .

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- *We elicit households' subjective beliefs regarding the **recent past** evolution of the French stock market index (CAC-40) over the last 5 years, I_{t-5} , relative to the time of the interview, I_t .*

What do We do (III)

TNS-2007 Survey Time

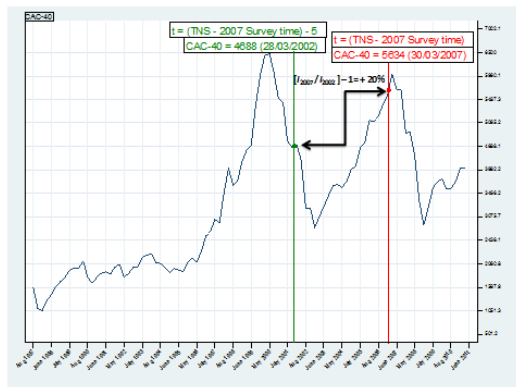


Figure: The French Stock Market Index CAC-40 between July 1987 and July 2011. Between March 2002 and March 2007 (5 years prior to the time of the survey) the index had increased by around 20%. Source: Author's calculations from MSN Money monthly data, available online.

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 ($p_{t+1,k}^i$). The sum of all your answers must be equal to 100

($\sum_k p_{t+1,k}^i = 100$):-

{ $k = 1 : R_{t+1} \in (0.25, R_{\max}^i]$ } -... will have increased by more than 25%

{ $k = 2 : R_{t+1} \in [0.10, 0.25]$ } -... will have increased by 10 to 25%

{ $k = 3 : R_{t+1} \in (0, 0.10)$ } -... will have increased by less than 10%

{ $k = 4 : R_{t+1} = 0$ } -... will be the same

{ $k = 5 : R_{t+1} \in (0, -0.10)$ } -... will have decreased by less than 10%

{ $k = 6 : R_{t+1} \in [-0.10, -0.25]$ } -... will have decreased by 10 to 25%

{ $k = 7 : R_{t+1} \in (-0.25, -R_{\min}^i]$ } -... 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)?' (R_{\max}^i)

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)?' (R_{\min}^i)

How do We do It (II)

Probabilistic Questions about Expected (Past) Stock Market Performance (over the past 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 ($p_{t+1,k}^i$) of different ranges (k) for the index percentage change ($R_{t+1}(5) \equiv \frac{I_{t+5}}{I_t} - 1$),

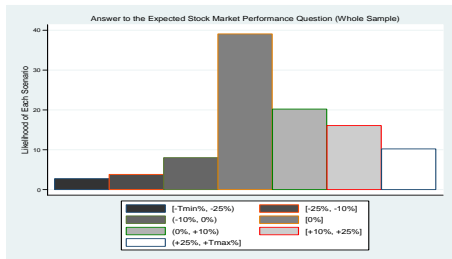
$$\forall i : p_{t+1,k}^i \equiv \Pr^i [R_{t+1} \in k] = \Pr^i \left[\frac{I_{t+5}}{I_t} - 1 \in k \right]$$

Similarly, if I_{t-5} \equiv Value of the CAC-40 Index 5 years prior to the time of the interview (March 2002, approx.),

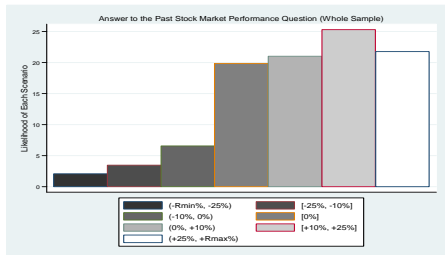
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How do They answer (I)

Average Expected (Past) Stock Market Performance (over the past) 5 years ahead:



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

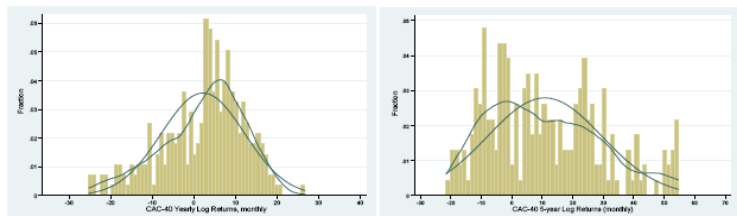


Histogram of average individual answers to the relative likelihood of the different scenarios regarding the stock market performance over the last 5 years. Source: TNS 2007.

- Pessimistic regarding the future, but on average well informed regarding the recent past

Rational Expectations

Density of nominal yearly (and 5-year rolling) log returns on the CAC-40 computed from monthly data between July 1987 and July 2011:



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

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

Figure: 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.

- Moments for (1-year) 5-year log returns ($\mu = 0.023$) $\mu(5) = 0.108$ and ($\sigma = 0.10$) $\sigma(5) = 0.19$.

What Others do (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?

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

$$\forall i: PNR^i \equiv \Pr^i \left[\frac{I_{t+5}}{I_t} - 1 > 0 \right] = \sum_{k=1}^3 p_{t+1,k}^i$$

What Others do (II): 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) *Business 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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4. Representative sample by wealth: Study the relationship between wealth-portfolio profiles and subjective expectations [Why is it that the rich do not invest in stocks?]

What Others do (III): Differences

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

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5. 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.
 - Accordingly, we define:

$$\forall i: pPNR^i \equiv \Pr^i \left[\frac{I_{t-5}}{I_t} - 1 > 0 \right] = \sum_{k=1}^3 p_{t,k}^i$$

How do They answer (II)

Descriptive Statistics: Probabilistic Questions about Stock Market Performance

Descriptive Statistics

Variable	No. Obs.	Mean	Std. Dev.	Min	Max
<i>Expected Return (ER)</i>	2460	0.055311	0.112602	-0.625	1.125
<i>Std. Dev. of ER</i>	2460	0.068028	0.07347	0	0.43056
<i>Past ER (pER)</i>	2231	0.11938	0.139876	-0.375	0.375
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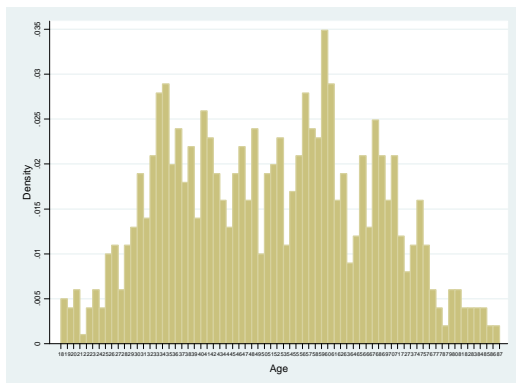
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- 2 They tend to be more pessimistic about the mean stock market performance 5 years ahead (still open), and
- 3 The average standard deviation for the 5 years ahead seems too low, but larger than that for the last 5 years

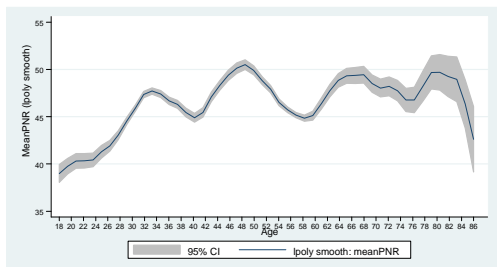
Stock Market Participation (TNS-2007) by Age

Main Beast to Tame

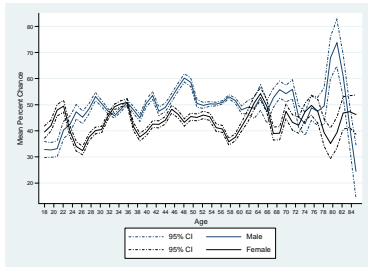


- The age-participation portfolio profile is *hump-shaped* in France

Expectations (PNR, TNS-2007) by Age and Gender



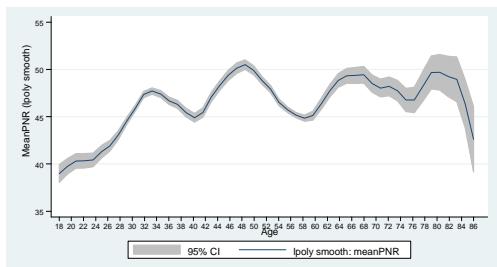
Mean PNR, conditional on age. Source: TNS 2007.



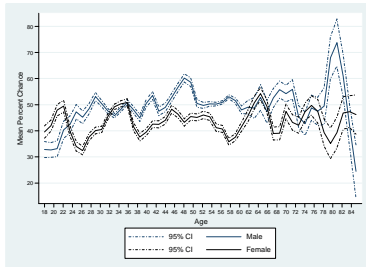
Mean PNR by age and gender. Source: TNS 2007.

- Subjective Stock Market Expectations appear hump-shaped over the life-cycle (alike participation)

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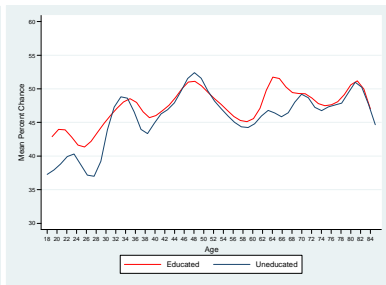
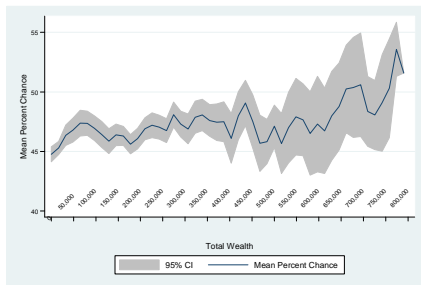
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- As in the US, males appear more optimistic than females...

Expectations (PNR, TNS-2007) by Wealth and Education

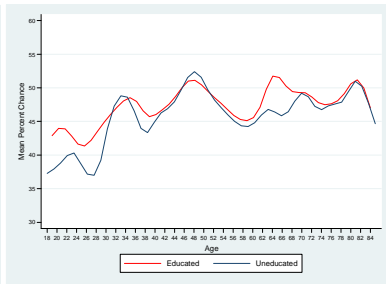
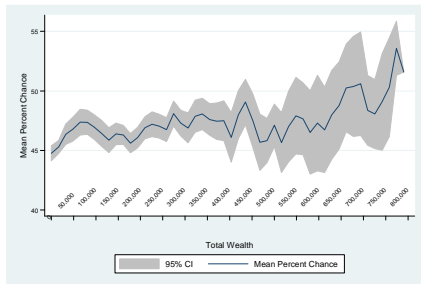


Mean percentage chance of a positive nominal return over the next 5 years (PNR) by total wealth. Source: TNS 2007.

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

- The wealthier are more optimistic regarding the future, albeit there is also more disagreement

Expectations (PNR, TNS-2007) by Wealth and Education

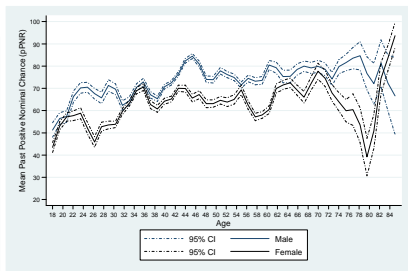
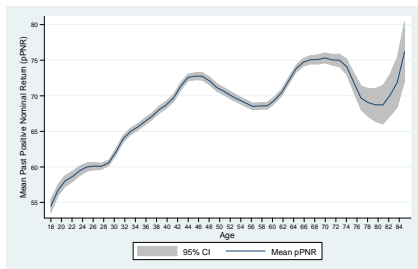


Mean percentage chance of a positive nominal return over the next 5 years (PNR) by total wealth. Source: TNS 2007.

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

- The wealthier are more optimistic regarding the future, albeit there is also more disagreement
- But the educated are marginally more optimistic than the uneducated.

Information (pPNR, TNS-2007) by Age and Gender

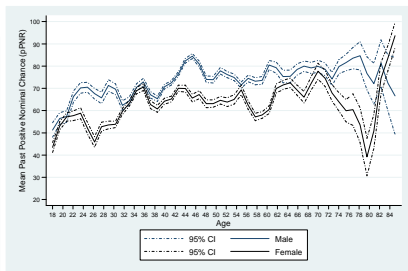
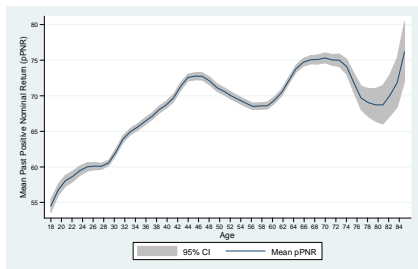


Mean percentage chance of a positive nominal return over the past 5 years (pPNR), by age. Source: TNS 2007.

Mean percentage chance of a positive nominal return over the past 5 years (pPNR), by age and gender. Source: TNS 2007.

- The young appear worse informed than the elderly [King and Leape (1987), Hurd (2009)]

Information (pPNR, TNS-2007) by Age and Gender

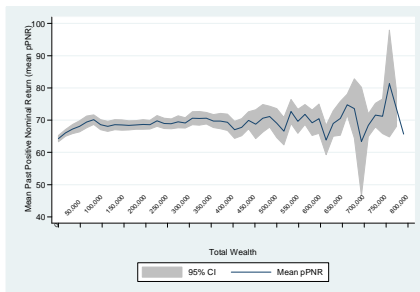


Mean percentage chance of a positive nominal return over the past 5 years (pPNR), by age. Source: TNS 2007.

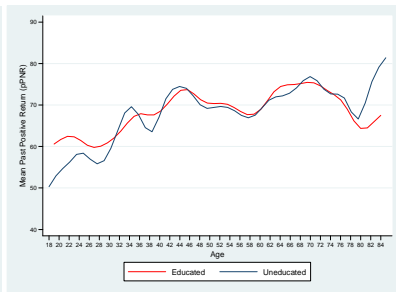
Mean percentage chance of a positive nominal return over the past 5 years (pPNR), by age and gender. Source: TNS 2007.

- The young appear worse informed than the elderly [King and Leape (1987), Hurd (2009)]
- Males appear better informed than females...

Information (pPNR, TNS-2007) by Wealth and Education



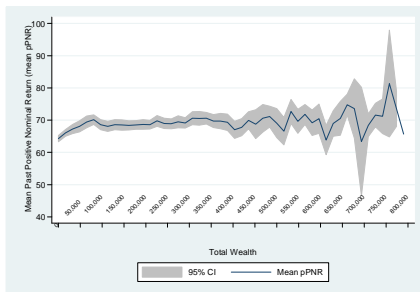
Mean percentage chance of a positive nominal return over the past 5 years (pPNR) by wealth. Source: TNS 2007.



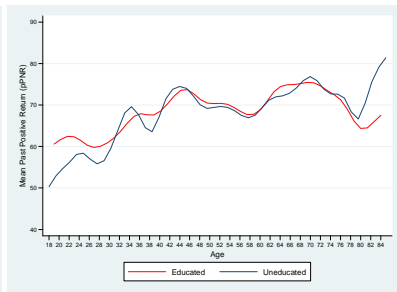
Mean percentage chance of a positive nominal return over the past 5 years (pPNR), by education. Source: TNS 2007.

- The wealthier are (slightly) better informed regarding the past,

Information (pPNR, TNS-2007) by Wealth and Education



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



Mean percentage chance of a positive nominal return over the past 5 years (pPNR), by education. Source: TNS 2007.

- The wealthier are (slightly) better informed regarding the past,
- But the educated are not better informed than the uneducated...

Does It work?

- Probit econometric specification:

$$\text{Stocks} = \mathbf{1}\{\delta_E p_{t+1} + \delta_I p_t + \mathbf{x}\delta + v > 0\} \quad \begin{array}{l} \text{(Participation)} \\ v \sim N(0, 1) \quad \text{(Probit)} \end{array}$$

$$\mathbf{x} = \underbrace{\{\text{CARA, Temporal Preference}\}}_{\text{Preferences}}; \underbrace{\{\text{Total Net Worth, Income}\}}_{\text{Endowments}};$$
$$\underbrace{\{\text{Liquidity C., MNG}\}}_{\text{Constraints}}; \underbrace{\{\text{Age, Education}\}}_{\text{Other Information proxies}}, \dots\}$$

Participation: All Ages

	(1)	(2)	(3)	(4)	(5)	(6)
Positive nominal return (PNR)	0.00185*** (0.000279)	0.00146*** (0.000299)	0.00139*** (0.000301)	0.00111*** (0.000310)	0.00121*** (0.000372)	0.00140*** (0.000352)
Male	0.0112 (0.0220)	0.00108 (0.0223)	-0.000288 (0.0224)	-0.0177 (0.0241)	0.00522 (0.0294)	0.0105 (0.0292)
Married/living with a partner	0.0572** (0.0238)	0.0585** (0.0238)	0.0688*** (0.0239)	-0.0182 (0.0267)	-0.0503 (0.0320)	-0.0519 (0.0320)
Age	0.00789* (0.00424)	0.00711* (0.00426)	0.00603 (0.00433)	-0.00585 (0.00461)	0.00372 (0.00569)	0.00433 (0.00567)
Age squared	-2.67e-05 (4.24e-05)	-2.10e-05 (4.25e-05)	1.34e-06 (4.34e-05)	8.64e-05* (4.59e-05)	-4.24e-06 (5.60e-05)	-8.98e-06 (5.59e-05)
Past positive nominal return (pPNR)		0.00115*** (0.000321)	0.00105*** (0.000323)	0.000853** (0.000333)	0.000642 (0.000394)	
<i>Education</i> (Ref. category: High school or less)						
Less than college			0.115*** (0.0396)	0.0450 (0.0417)	0.0359 (0.0520)	0.0359 (0.0520)
College or more			0.256*** (0.0438)	0.113** (0.0484)	0.126** (0.0576)	0.127** (0.0576)
Income (10E-6)				7.204*** (2.300)	6.076** (2.971)	6.035** (2.964)
Income squared (10E-11)				-6.760** (2.989)	-8.035** (4.081)	-7.836* (4.066)
Net worth (10E-7)				12.94*** (2.035)	9.874*** (2.470)	9.880*** (2.470)
Net worth squared (10E-13)				-7.975** (3.262)	-4.906 (3.262)	-4.918 (3.943)
Self account management					-0.137*** (0.0271)	-0.136*** (0.0271)
Risk aversion (CARA)					-0.219 (0.353)	-0.239 (0.353)
Liquidity constraint					-0.116*** (0.0294)	-0.117*** (0.0294)
Firm shares in remuneration					0.0656 (0.0566)	0.0676 (0.0565)
Temporal preference					0.0120* (0.00650)	0.0118* (0.00649)
Online banking					0.101*** (0.0314)	0.103*** (0.0313)
Pseudo R-squared	0.0426	0.0472	0.0639	0.1191	0.1251	0.1239

Participation: The Elderly

	(1)	(2)	(3)	(4)	(5)	(6)
Positive nominal return (PNR)	0.00194*** (0.00043)	0.00179*** (0.000457)	0.00179*** (0.000459)	0.00144*** (0.000481)	0.00169*** (0.000562)	0.00165*** (0.000536)
Male	0.0195 (0.0359)	0.0144 (0.0363)	-8.16E-05 (0.0366)	-0.0328 (0.0404)	0.00345 (0.0478)	0.00195 (0.0474)
Married/living with a partner	0.0542 (0.0392)	0.0542 (0.0393)	0.0685* (0.0396)	-0.0117 (0.0441)	-0.0538 (0.0514)	-0.0534 (0.0514)
Age	0.0763** (0.0352)	0.0758** (0.0353)	0.0840** (0.0356)	0.0647* (0.037)	0.0866** (0.0421)	0.0866** (0.0421)
Age squared	-0.000567** (0.000279)	-0.000564** (0.000279)	-0.000620** (0.000282)	-0.000472 (0.000292)	-0.000675** (0.000333)	-0.000675** (0.000333)
Past positive nominal return (pPNR)		0.0005 (0.000503)	0.000507 (0.000505)	0.000387 (0.000529)	-0.000148 (0.000615)	
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

Participation: The Young

	(1)	(2)	(3)	(4)	(5)	(6)
Positive nominal return (PNR)	0.00177*** (0.000365)	0.00118*** (0.000392)	0.00106*** (0.000393)	0.000750* (0.000403)	0.000747 (0.0005)	0.00119** (0.00047)
Male	0.0124 (0.0277)	0.000113 (0.0279)	0.0115 (0.0281)	0.000977 (0.0302)	0.0162 (0.0379)	0.0253 (0.0376)
Married/living with a partner	0.0322 (0.031)	0.0370 (0.031)	0.0491 (0.031)	-0.0379 (0.0348)	-0.0586 (0.0426)	-0.0625 (0.0425)
Age	0.0453*** (0.0146)	0.0436*** (0.0146)	0.0335** (0.015)	2.45E-02 (0.0158)	0.0201 (0.0209)	0.0214 (0.0208)
Age squared	-0.000584*** (0.000206)	-0.000573*** (0.000207)	-0.000420** (0.000212)	-0.000371* (0.000223)	-0.000277 (0.000292)	-0.000284 (0.000291)
Past positive nominal return (pPNR)		0.00165*** (0.000411)	0.00143*** (0.000414)	0.00122*** (0.000423)	0.00136*** (0.000518)	
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

Participation: Direct Stockholders by Age Groups

	Age < 50		50 ≤ Age ≤ 80		All ages	
	(1)	(2)	(1)	(2)	(1)	(2)
Positive nominal return (PNR)	0.000900** (0.000364)	0.000389 (0.000413)	0.00107** (0.000453)	0.000850* (0.000515)	0.00102*** (0.000281)	0.000682** (0.000320)
Male	0.00341 (0.0289)	-3.53e-05 (0.0310)	0.0165 (0.0396)	0.0115 (0.0441)	0.00509 (0.0232)	0.00228 (0.0253)
Married/living with a partner	-0.0233 (0.0334)	-0.0286 (0.0355)	-0.0575 (0.0451)	-0.0391 (0.0489)	-0.0378 (0.0264)	-0.0321 (0.0282)
Age	-0.0149 (0.0160)	-0.0124 (0.0171)	0.0283 (0.0367)	0.0135 (0.0395)	0.00387 (0.00461)	0.00247 (0.00496)
Age squared	0.000210 (0.000222)	0.000156 (0.000237)	-0.000235 (0.000290)	-0.000123 (0.000313)	-1.83e-05 (4.52e-05)	-5.40e-06 (4.84e-05)
Past positive nominal return (pPNR)		0.00129*** (0.000433)		0.000348 (0.000566)		0.000851** (0.000343)
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

Participation: by Account Manager and Information

	Self account management		Financial advisor or other		pPNR=100	pPNR< 100
	(1)	(2)	(1)	(2)	(1)	(2)
Positive nominal return (PNR)	0.00116*** (0.000445)	0.000842* (0.000505)	0.00157*** (0.000482)	0.00173*** (0.000551)	0.000788* (0.000473)	0.00144*** (0.000546)
Male	0.105*** (0.0378)	0.0918** (0.0405)	-0.0869** (0.0393)	-0.0897** (0.0424)	0.0860** (0.0435)	-0.0733* (0.0388)
Married/living with a partner	-0.0716* (0.0421)	-0.0448 (0.0445)	-0.0700 (0.0435)	-0.0494 (0.0465)	-0.110** (0.0464)	0.000635 (0.0422)
Age	0.00203 (0.00742)	-0.000307 (0.00796)	0.0110 (0.00778)	0.00798 (0.00825)	-0.00357 (0.00856)	0.00683 (0.00760)
Age squared	-3.90e-06 (7.35e-05)	1.90e-05 (7.89e-05)	-5.82e-05 (7.65e-05)	-2.87e-05 (8.09e-05)	3.55e-05 (8.25e-05)	-1.56e-05 (7.61e-05)
Past positive nominal return (pPNR)		0.000830 (0.000551)		0.000383 (0.000566)		
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

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 - ... but *Inertia*: no panel dimension exploited here... (see slide after next)
- Determine conditional asset demands (better than Hurd *et al.*, 2011, similar to Kedzi and Willis, 2009): next presentation...

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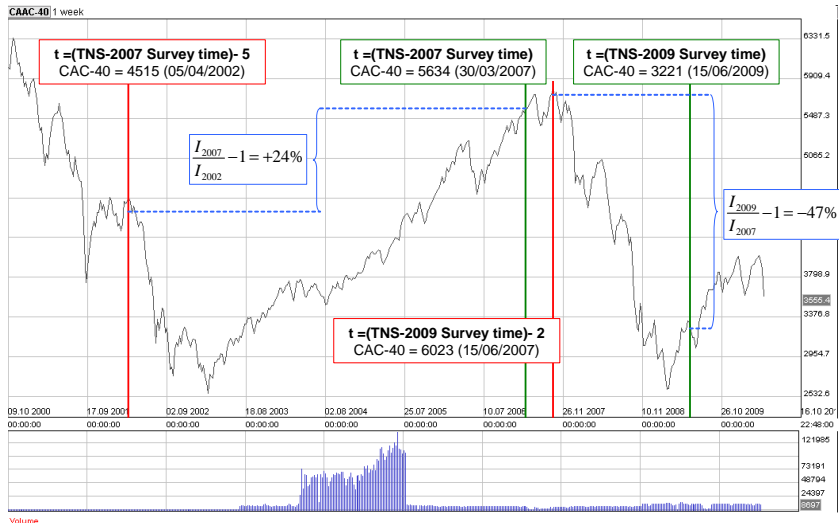
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 - [So far the median coefficient of relative risk aversion is around 80... for 561 observations!]

Research Agenda (II): Event Study and (short) Panel

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 (\tilde{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?'

$$u^i(w_i) = \frac{1}{2}u^i(w_i + 5,000) + \frac{1}{2}u^i(w_i - Z_i) = Eu^i(w_i + \tilde{S}_i)$$

$$A_i(w_i) = 2 \frac{5000 - Z_i}{5000^2 + Z_i^2}$$

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.

Attribute	Male							Female						
	Number of respondents to PNR	Mean	Standard Deviation	Quantile			Rate of response to PNR	Number of respondents to PNR	Mean	Standard Deviation	Quantile			Rate of response to PNR
				0.25	0.50	0.75					0.25	0.50	0.75	
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".

TNS 2007 vs HRS 2004 (I):

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)

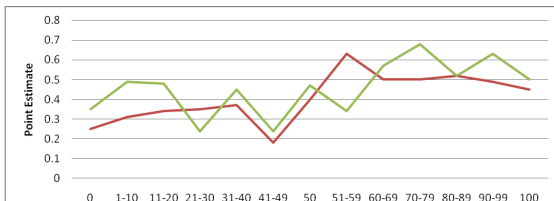
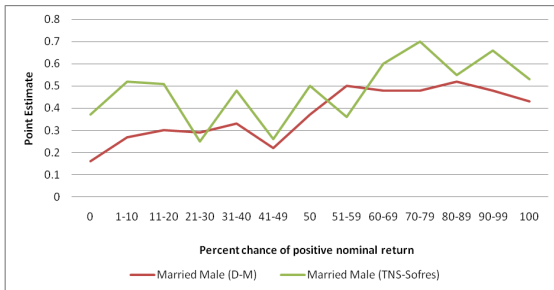
Table 3. Probability of holding stocks or stock mutual funds conditional on percent chance of positive nominal return, gender and marital status (age 50-80)

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 a positive Stock Market return...

TNS 2007 vs HRS 2004 (II):

- ...*Albeit* in a more volatile way than in the US, since we have less observations



Appendix 3: Kedzi and Willis, 2009 wp (I)

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

$$\left. \begin{aligned}
 \tilde{R}_{i(t+1)j} &= \underbrace{\mu_{it} + \eta_{it}}_{\equiv R_{i(t+1)}} + \underbrace{v_{itj}}_{\text{Classical Measurement Error}} \\
 \eta_{it} | \mu_{it} &\sim i.i.d.N(0, \sigma_i^2) \\
 v_{itj} | (\mu_{it}, \eta_{it}) &\sim i.i.d.N(0, \sigma_{vj}^2), j = \{0, 0', 10, 10'\} \\
 p_{ij}^* &= \Pr(\tilde{R}_{ij} > \tau_j | \mu_i, v_{ij}) = \Phi\left(\frac{\mu_i + v_{ij} - \tau_j}{\sigma_i}\right), \tau_j = \{0, 0', .1, .1'\}
 \end{aligned} \right\} \begin{array}{l} \text{CRRRA} \\ \implies \end{array}$$

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

$$\xrightarrow{\text{CRRA}} \begin{cases} \alpha_i^* = \beta'_\alpha x_i + \tau \frac{\mu_i^{-r}}{\sigma_i^2} + u_{\alpha i} \\ \mu_i = \beta'_\mu x_i + \gamma'_\mu z_{\mu i} + u_{\mu i} \\ \log(\sigma_i) = \beta'_\sigma x_i + \gamma'_\sigma z_{\sigma i} \end{cases}$$

$x_i \equiv$ [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 $\hat{\tau} > 0$ statistically significant AND **small**, i.e. CRRA parameter around 3 (55-65 year-olds)

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

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

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

$$\Rightarrow \left\{ \begin{array}{l} \text{Stocks} = 1\{\beta'_p x_i + T_\mu \mu_i + T_\sigma \sigma_i^2 + u_{pi} > 0\} \quad (\text{Participation}) \\ \mu_i = \beta'_\mu x_i + \gamma'_\mu z_i + u_{\mu i} \\ \sigma_i = \beta'_\sigma x_i + \gamma'_\sigma z_i + u_{\sigma i} \end{array} \right.$$

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

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

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

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

$$\Rightarrow \left\{ \begin{array}{l} Stocks = 1\{\beta'_p x_i + T_\mu \mu_i + T_\sigma \sigma_i^2 + u_{pi} > 0\} \quad (\text{Participation}) \\ \mu_i = \beta'_\mu x_i + \gamma'_\mu z_i + u_{\mu i} \\ \sigma_i = \beta'_\sigma x_i + \gamma'_\sigma z_i + u_{\sigma i} \end{array} \right.$$

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

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

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