Informative Social Interactions

Cherry Blossom Financial Education Institute, Washington, D.C.

L. Arrondel, H. Calvo-Pardo, C. Giannitsarou and M. Haliassos

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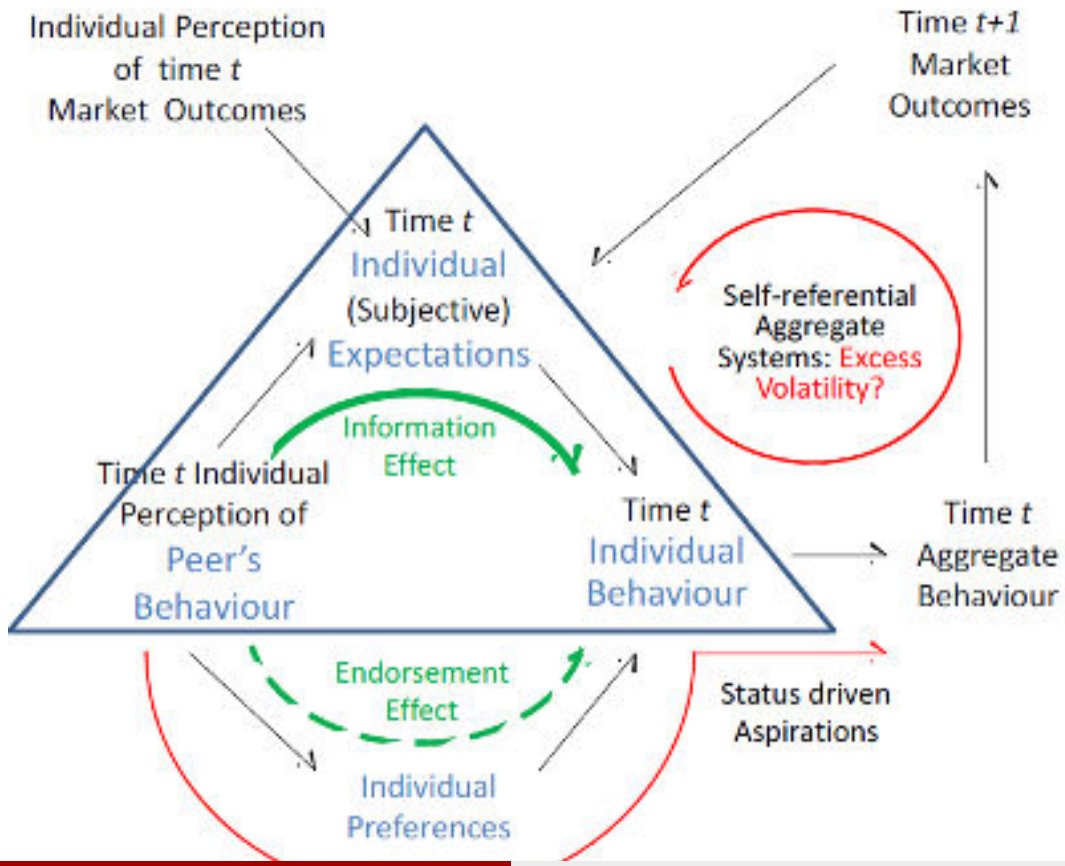
Question and Motivation

- *Do social interactions matter for financial behaviour?* i.e.
  - Does stock market **information from/participation of others** affect own stockholdings?
  - If yes, how and why?
- Why do we care?
  - 2008 subprime mortgage crisis: Is there a role for **social interactions** in the spread of (*poor*) financial behavior?
  - Efficient dissemination of information on financial products/assets, e.g. 'fintech';
  - Regulation: designing and regulating successful/'fashionable' on-line investment clubs;
  - Public policies aiming at overcoming financial literacy limitations in the population, potentially responsible for raising wealth inequality, booms and busts in asset markets, etc.

What do We Do

We design and collect novel primary data, and find that **social interactions** affect individual stock market decisions mostly by being **informative** (peer information exchanges and *mindful* imitation); to a lesser extent, also by endorsement effects (*mindless* imitation)**:**

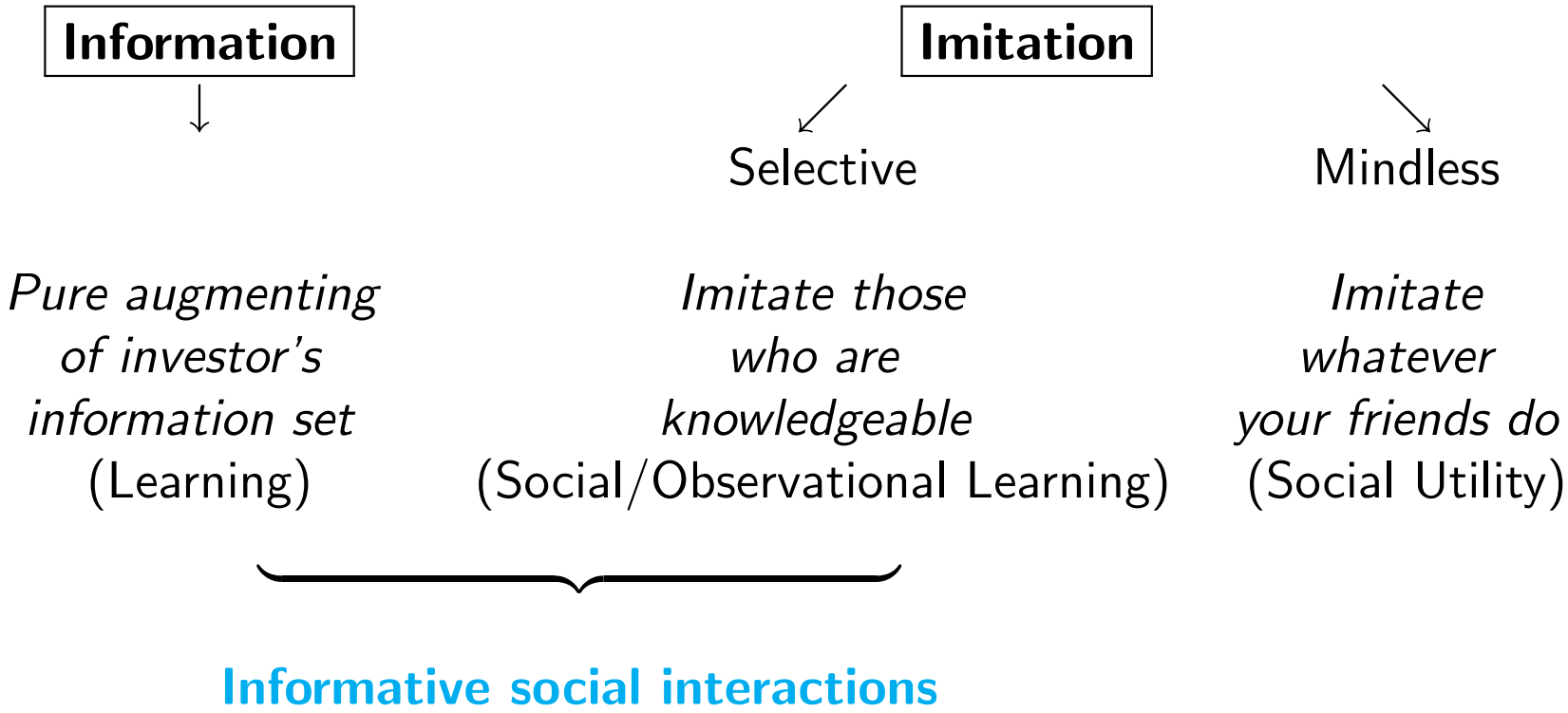


Literature

1. Literature on social interactions/peer effects on asset and debt behavior of households, e.g. Duflo and Saez (2002), Hong, Kubik and Stein (2004), Kaustia and Knüpfer (2012), Georgarakos, Haliassos and Pasini (2014), Haliassos, Jansson and Karabulut (2017) or Ouimet and Tate (2017).
2. Literature on the effects of social imitation and influence on financial behavior:
    - Banerjee, Chandrasekhar, Duflo and Jackson (2013): identify a pure information effect (new financial product, microfinance in India)
    - Bursztyn, Ederer, Ferman and Yuchtman (2014): identify both information and endorsement/social utility effects (experiment with new financial product amongst brokerage account holders in Brazil)
    - Burnside, Eichenbaum and Rebelo (2016) and Bailey, Cao, Kuchler and Stroebel (2016): model, calibrate and identify a social interactions effect on housing in the US, respectively.

Our contribution: complementary; we study the prevalence of social learning and imitation in a representative sample of the population of a financially developed country and for an established financial product (stock market).

What Do People Get Out of Social Interactions?



An Information Network within an Efficient Market

- Within Hellwig (1980),
  - Static asset pricing model with a risky and a riskless asset, where asset prices transmit information
  - Large number of heterogeneous agents with individual private signals on risky asset payoff (stocks)
- Ozsoylev and Walden (2011) embed an information network,
  - Network connections are exogenous
  - Agents pool information by averaging signals from others they are connected to
  - Agents form expectations about the net excess return on the basis of pooled signals and prices
  - *No social utility motive* (conformity, etc.) within expected utility function
- We extend Ozsoylev and Walden (2011) to:
  - Heterogeneity in signal precision and risk preferences (Cabrales et al., 2013, 2017)
  - Agents' pooled information is **weighted** by the precisions of connections' signals

Model

Main result

- Let the *connectedness* of investor i be

$$(1) \quad k_i = \sum_{k=1}^{n} \frac{a_{ik}}{s_k^2}$$

- Let the average connectedness of the information network be

$$\lim_{n\to\infty} \frac{1}{n} \sum_{i=1}^{n} \frac{k_i}{\rho_i} = \beta + o(1), \ \beta < \infty$$

- Under reasonable/interpretable assumptions, as $n \longrightarrow \infty$, there exists a NREE price p for the risky asset, which *depends on a single network statistic*: average risk-adjusted network connectedness β

Main Predictions of the Model

- In a large anonymous financial market, agents with more/better informed connections, k_i^*:
  1. Form expectations of returns that give more weight to connections' signals (i's pooled signal x_i),

$$\mathbb{E}\left(X|\mathcal{I}_i\right) = \frac{k_i^*\sigma^2\Delta^2}{k_i^*\sigma^2\Delta^2 + \Delta^2 + \sigma^2\beta^2}x_i + \left(\frac{\sigma^2\beta^2 + \Delta^2}{k_i^*\sigma^2\Delta^2 + \Delta^2 + \sigma^2\beta^2}\right)\bar{X}$$

  2. Invest a higher proportion of their financial wealth in risky assets,

$$D_i^* = \frac{\mathbb{E}\left[\left(X - p\right)|\mathcal{I}_i\right]}{\rho_i Var\left[X|\mathcal{I}_i\right]} = \frac{\left(\mathbb{E}\left(X|\mathcal{I}_i\right) - p\right)}{\rho_i}\left(\frac{1}{\sigma^2} + k_i^* + \frac{\beta^2}{\Delta^2}\right)$$

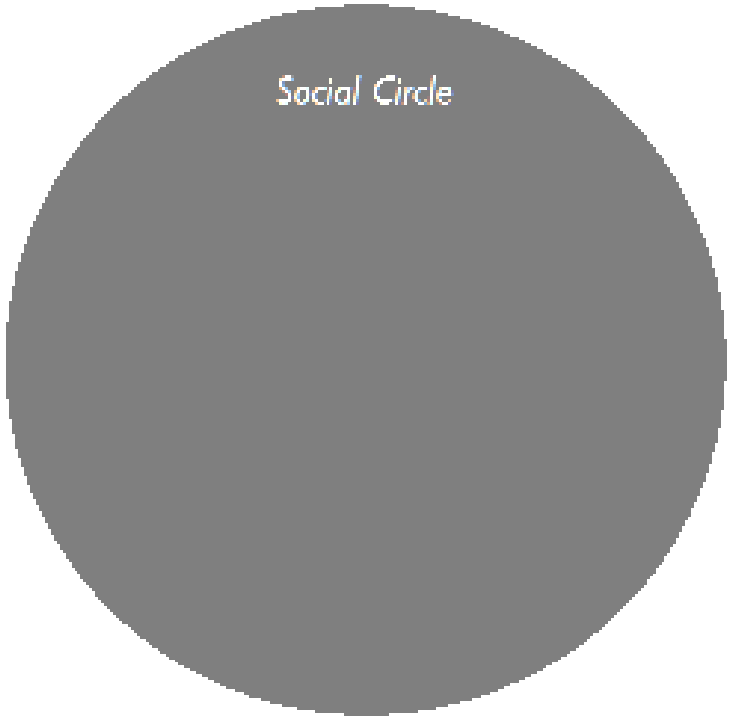
  i.e. they hold a *lower posterior variance of returns*.

Survey Design

- Survey designed to look for information effect of social interactions on stockholding by households;
- Part of ongoing survey on a representative sample of the French population by age and asset classes (PAT€R);
- Two questionnaires (TNS2014 and follow-up TNS2015), sent to 4,000 households: Unit responses to TNS2014 = 3,670. Of those, unit responses to TNS2015 = 2,587 (70.5% response rate);
- Questions on:
  - Respondent's risk preferences, socio-economic and demographic characteristics
  - Financial wealth (total and % invested in the stock market)
  - Perceptions and expectations about stock market returns (CAC-40) elicited probabilistically (Manski, 2004)
  - Detailed questionnaire for measures of individual connectedness, information and participation of peers

Proxy for Connectedness: Social Circle

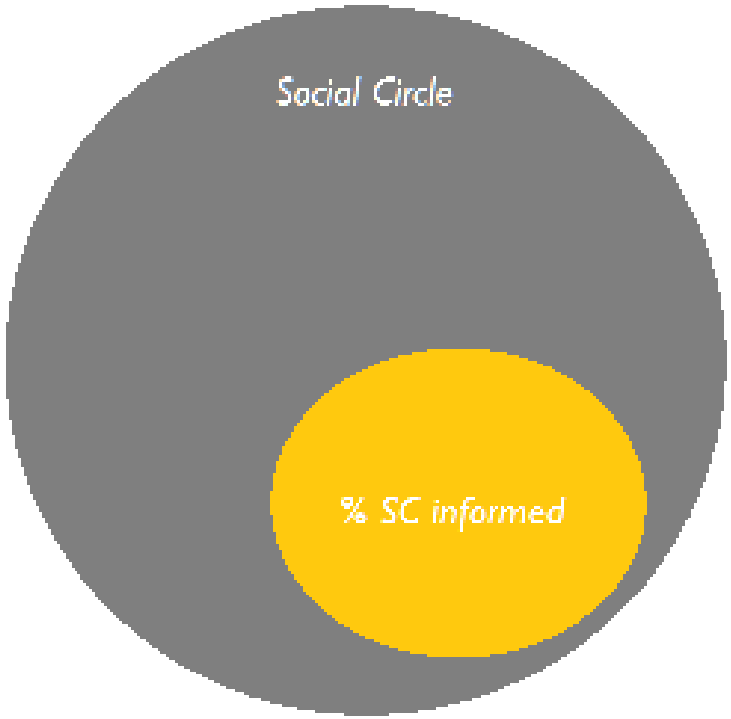
C1: '*Approximately how many people are there in your social circle of acquaintances?*'



(Average: 53 approx.)

Proxy for Connectedness: Social Circle

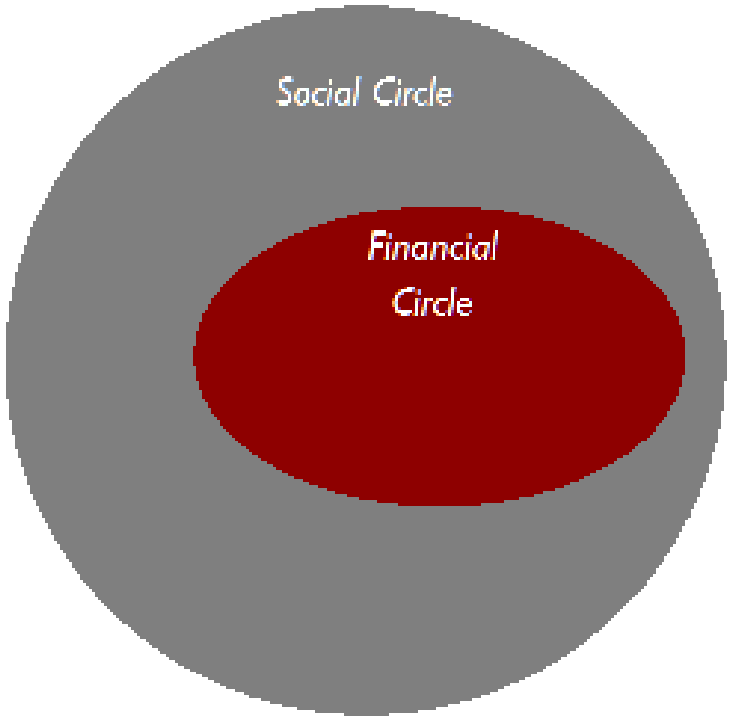
C7i: '*In your opinion, what is the proportion of people in your social circle that is informed about/follows the stock market?*'



(Average: 13% approx.)

Proxy for Connectedness: Financial Circle

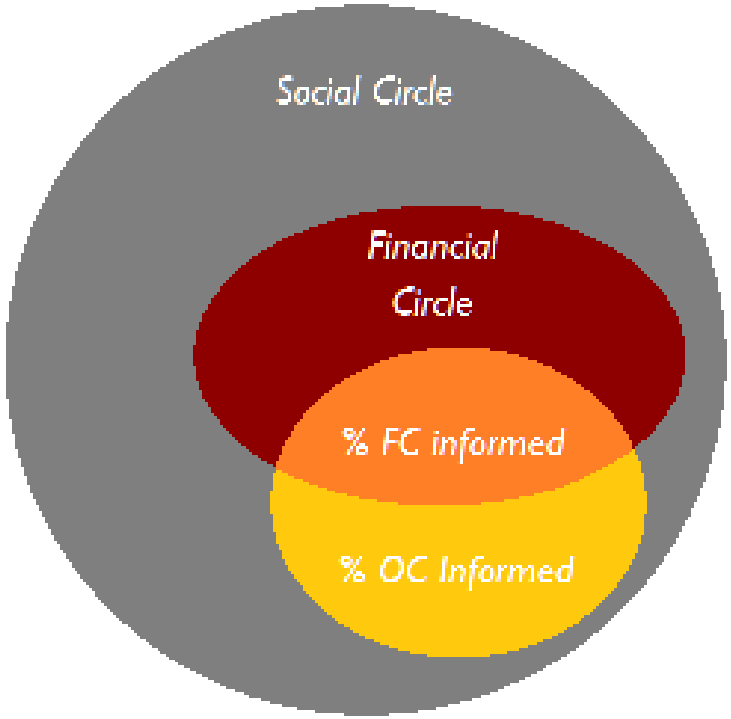
D1: '*With how many people from your social circle do you interact with regarding your financial/investment matters?*'



(Average: 3 approx.)

Proxy for Connectedness: **Info** from Financial Circle

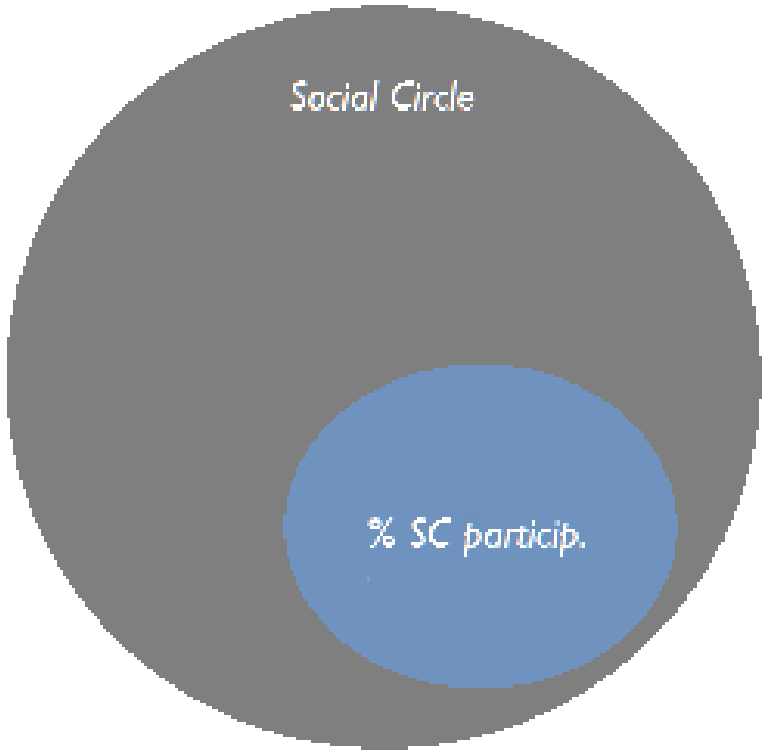
D16i: '*In your opinion, what is the proportion of people in your financial circle that follows the stock market?*'



(Average: 22% approx.)

Selective Imitation

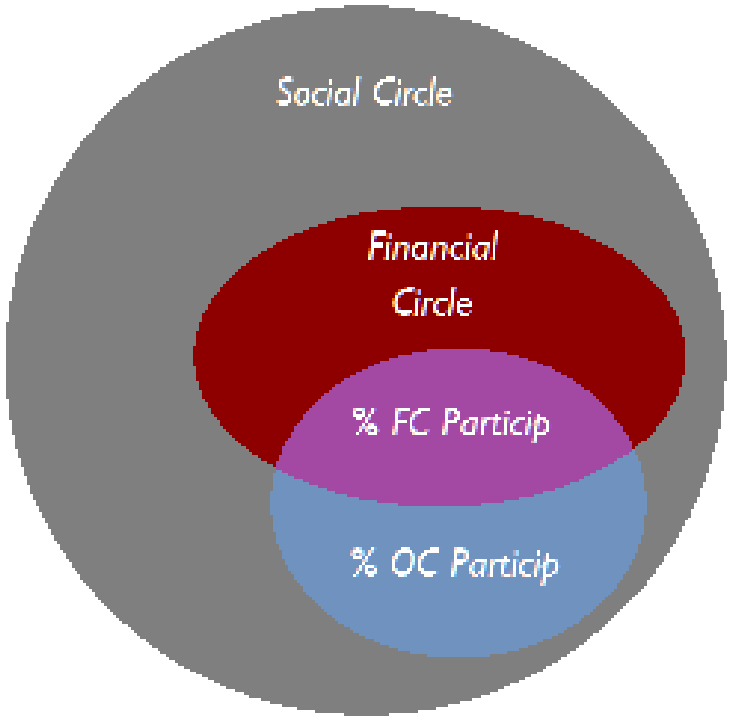
Repeat analysis but asking survey questions (C7ii) regarding the **participation** of acquaintances in the stock market...



(Average: 11% approx.)

Selective Imitation: Financial Circle

... separating those with whom the respondent exchanges on financial matters (Fin. Circle, FC) from those with whom s/he does not (Outer Circle, OC):



(Average: 20% approx.)

Do Social Interactions Influence Expectations of Returns?

- OLS Econometric specification(s):

$$Expec.\ R_i = \kappa_0 + \kappa_1 k_i^* + \boldsymbol{\tau}_i \boldsymbol{\kappa} + e_i$$

- Proxies for connectedness k_i^*: $\%SC\ Inform$, $k_{i,SC}^*$ the share of respondents' social circle (SC) informed about the stock market, which we then *split* into $\%FC\ Inform$, $k_{i,FC}^*$ and $\%OC\ Inform$, $k_{i,OC}^*$:

$$Expec.\ R_i = \kappa_0 + \underset{(+)}{\kappa_{1,FC} k_{i,FC}^*} + \underset{(0)}{\kappa_{1,OC} k_{i,OC}^*} + \boldsymbol{\tau}_i \boldsymbol{\kappa} + e_i$$

- (Proxies for selective and mindless'imitation' D_i^e : $\%SC\ Particip$, *split* into $\%FC\ Particip$, $\%OC\ Particip$)
- Controls, $\boldsymbol{\tau}_i$: Age, gender, marital status, No. of children at home, education, region of residence, employment status, borrowing constraints, quartiles for wealth, income and (last 12-month) saving, *own perception about population behaviour/information*, elicited risk (RA_i) and *for relative standing* (profession, edu., wealth) *preferences.*

Social Interactions Effect on Expectations: the Informed

	Expec R	Expec R
% SC Inform.	0.0238	
	(0.0230)	
% FC Inform.		0.0283**
		(0.0136)
% OC Inform.		-0.0050
		(0.0269)
% Pop. Inform.	-0.0085	-0.0039
	(0.019)	(0.019)
Risk aversion	-0.0504	-0.0584
	(0.0399)	(0.0393)
Rel. Stand. Pref.	n.s.	n.s.
Controls	*Yes*	*Yes*
F (p-value)	2.43 (0)	2.33 (0)
R^2	0.043	0.046
Observations	2,535	2,535

Social Interactions Effect on Expectations: Information/(Selective) Imitation

	Expec R	Expec R
% SC Particip.	0.0282	
	(0.0279)	
% FC Particip.		0.0236*
		(0.0126)
% OC Particip.		0.00453
		(0.0358)
% Pop. Particip.	-0.0060	-0.0014
	(0.023)	(0.023)
Risk aversion	-0.0513	-0.060
	(0.040)	(0.0393)
Rel. Stand. Pref.	n.s.	n.s.
Controls	*Yes*	*Yes*
F (p-value)	2.39 (0)	2.38 (0)
R^2	0.044	0.046
Observations	2,535	2,535

Directly Informative Social Interactions

...Reduce the Posterior Variance of Returns

- Tobit (Probit) peer effects econometric specification(s):

$$D_i = \max\{0,\ \lambda_0 + \underset{(+)}{\lambda_1}\, k_i^* + \underset{(+)}{\lambda_2}\, Expec.\ R_i + \boldsymbol{\tau}_i'\boldsymbol{\lambda} + u_i\}$$

- Where $D_i \equiv \%FW_i$ denotes the share of respondent's financial wealth invested into stocks (Tobit), whilst $D_i \equiv \Pr(Stocks_i > 0)$ denotes the likelihood of individual i being a stockholder (Probit)
- Proxies for k_i^*: $\%SC\ Inform$, *split* into $\%FC\ Inform$, $\%OC\ Inform$
- (Proxies for selective and mindless'imitation' D_i^e : $\%SC\ Particip$, *split* into $\%FC\ Particip$, $\%OC\ Particip$)

Pure Information: Stockholding

	Pr(Stocks>0)	%FW	Pr(Stocks>0)	%FW
% SC Inform.	0.00256**	0.0823**		
	(0.00104)	(0.0341)		
% FC Inform.			0.00267***	0.0289
			(0.000588)	(0.0197)
% OC Inform.			0.000234	0.0409
			(0.00132)	(0.0419)
% Pop. Inform.	n.s.	(-)*	n.s.	n.s.
Expec R	0.00220**	0.103***	0.00201**	0.104***
	(0.000963)	(0.0337)	(0.000958)	(0.0352)
Risk aversion	-0.00422**	-0.101*	-0.00415**	-0.108*
	(0.00188)	(0.0575)	(0.00187)	(0.0600)
Rel. Stand. Pref.	n.s.	n.s.	n.s.	n.s.
Controls	*Yes*	*Yes*	*Yes*	*Yes*
Log-likelihood	-1201	-3625	-1192	-3623
LR χ^2 (p-value)	420.2 (0)	394.5 (0)	445.0 (0)	398.5 (0)
Pseudo-R^2	0.169	0.0516	0.175	0.0521
Observations	2,525	2,294	2,525	2,294

Selective Imitation: Stockholding

	Pr(Stocks>0)	%FW	Pr(Stocks>0)	%FW
% SC Particip.	0.00498***	0.0865***		
	(0.000936)	(0.0293)		
% FC Particip.			0.00217***	0.0325*
			(0.000649)	(0.0192)
% OC Particip.			0.00246*	0.0791**
			(0.00127)	(0.0402)
% Pop. Particip.	n.s.	n.s.	n.s.	n.s.
Expec R	0.00204**	0.103***	0.00195**	0.106***
	(0.000932)	(0.0343)	(0.000934)	(0.0368)
Risk aversion	-0.0039**	-0.096*	-0.00396**	-0.107*
	(0.00179)	(0.0568)	(0.00180)	(0.0624)
Rel. Stand. Pref.	n.s.	n.s.	n.s.	n.s.
Controls	*Yes*	*Yes*	*Yes*	*Yes*
Log-likelihood	-1196	-3623	-1194	-3629
LR χ^2 (p-value)	440.6 (0)	398.7 (0)	434.6 (0)	403.3 (0)
Pseudo-R^2	0.172	0.0522	0.174	0.0528
Observations	2,525	2,294	2,525	2,294

Mechanism: Social Interactions Affect Own Information

- We have evidence of informed peer effects on own subjective expectations of returns and own stockholding:
  a higher proportion of informed/participating peers *increases subjective sharpe ratios* and thereby, stockholding at both margins...
- Does talking to optimists make you more optimistic?
  No: Talking to informed peers makes you better informed about *facts*
- Relevant fact No.1 $\approx$ the (most recently) realised (3-year) cumulative stock return $R_t(3)$ was 34.57%
- We elicit probabilistically respondents' perception about $R_t(3)$, and compute the mean response for each individual, R_t^i denoted '*Perc.* R_i'.
  Cross-sectional sample mean is 3.6%, i.e. the average respondent has a **perception gap** which *underestimates the truth* by around *ten times*.
- We therefore examine whether a larger share of informed peers *reduces* the 'perception gap', as follows:

$$Perc.\ R_i = \eta_0 + \underset{(+)}{\eta_{1,FC} k^*_{i,FC}} + \underset{(0)}{\eta_{1,OC} k^*_{i,OC}} + \mathbf{v}_i\boldsymbol{\eta} + \varrho_i$$

Mechanism: Social interactions Affect Own Information

	Perc. R.	Perc. R.	Expec. R.	Expec. R.	Expec. R.
% FC Inform.	0.0554***			0.0135	
	(0.0208)			(0.0135)	
% OC Inform.	0.0091			-0.00651	
	(0.0372)			(0.0250)	
% Pop. Inform.	n.s.		n.s.	n.s.	
% FC Particip.		0.0481**			0.0102
		(0.0214)			(0.0124)
% OC Particip.		0.0523			-0.00563
		(0.0474)			(0.0347)
% Pop. Particip.		n.s.	n.s.		n.s.
Perc. R.			0.282***	0.282***	0.283***
			(0.0265)	(0.0264)	(0.0264)
Rel. Stand. Pref.	n.s.	n.s.	n.s.	n.s.	n.s.
Controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
$F\ (p-value)$	4.149 (0)	4.152 (0)	4.391 (0)	4.262 (0)	4.332 (0)
R^2	0.0975	0.0971	0.157	0.159	0.159
Observations	2,328	2,328	2,535	2,535	2,535

Findings

- Socially interacting with informed peers *raises own subjective sharpe ratios*, levelling up respondents' (scant) information with publicly available data:
  - a 1StDev increase in informed peers (about 1 additional informed person) *reduces the perception gap* by +1 p.p. (by 27% relative to the unconditional mean, *u.m.*, perception of +3.6%);
- Conditioning on expectations, informed peer information and stockholdings increase own stockholdings (by reducing the posterior variance of returns):
  - a 1StDev increase in informed/stockholding peers increases own stockholdings by +7/6.3 p.p. (or by about 34%/28% relative to the *u.m.*) and the conditional share by +0.92 p.p., or by about 4.3% relative to the *u.m.*
- Evidence supports an overall positive effect of **informative social interactions**
- There are smaller albeit significant effects of share of **outer circle** participating on stockholdings, without affecting respondents' expectations or perceptions of returns $\Longrightarrow$ some evidence of mindless imitation:
  - a 1StDev increase in OC peer stockholding increases own stockholdings by +4.2 p.p. (i.e. a 19.5% increase relative to the *u.m.*) and the conditional share by +1.3 p.p. , or by about 6.3% relative to the *u.m.*

Unobserved Heterogeneity

1. We exploit within-respondent variation in peer group behaviour/information to find statistical evidence *mostly* in support of 'financial circle' effects *only* ('**double ring**' methodology, Grinblatt *et al.*, 2008)
2. The effects are conditional on individual perceptions of population behaviour/information, as one guard against **correlated effects,** e.g. from a 'news shock' or a 'market trend' (i.e. a novel 'triple ring' methodology)
3. We include very **detailed individual covariates**, *including* questions about how do respondents view themselves relative to the members of the social and financial circles to control for social utility motives, and find no evidence in support of the latter
4. We conduct counterfactual **placebo tests**, by randomizing individual responses to questions on financial circle information and participation: artificial 'in-sample' bins constructed on age, education and region of residence provide no evidence in support of an unobserved group effect
5. Results robust to **selection of peers/acquaintances** with whom to interact on respondents' financial matters, which supports the identification of an information peer effect on individual stockholdings (Blume *et al.* 2011, 2015)

Summary and Going Forward

- Theory suggests that social interactions improve investors information about the stock market
- i.e. investors are more likely to invest, and to invest more, the higher the number/quality of 'informed peers'
- We find evidence in support of this: social interactions raise own subjective sharpe ratios, better aligning own (scant) information with publicly available (historical) evidence.
- Main result: strong evidence of a social interactions' **information channel** in a *developed country mature financial market*
- '*Herding is less prevalent than you think*'... but we also find some evidence of 'mindless imitation' in stock market decisions
- Social interactions reduce *factual perception gaps*, creating the potential for financial literacy interventions (Beshears, Choi, Laibson, Madrian and Milkman, 2015) that can vehiculate a social multiplier effect with the aim of reducing wealth inequality (Lusardi, Michaud and Mitchell, 2016).

Appendix: Separating social from financial circle

C1: *Approximately how many people are there in your social circle of acquaintances?*

D1: *With how many people from your social circle (as identified in C1) do you interact with regarding your financial/investment matters?*

C7i/D16i: *In your opinion, what is the proportion of people in your social/financial circle that invests in the stock market? (as a %)*

C7ii/D16ii: *In your opinion, what is the proportion of people in your social/financial circle that is informed about the stock market? (as a %)*

Appendix: Separating social from financial circle

Variable	Mean all	Mean inv	Questions
SC	53	53.6	C1
FC	3	3	D1
OC	–	–	C1-D1
%SC Inform.	12.6%	15.8%	C7ii
%SC Particip.	10.7%	15.3%	C7i
%FC Inform.	20.5%	28.2%	D16ii
%FC Particip.	18.9%	27.7%	D16i
%OC Inform.	11.5%	17.36%	$\frac{C1 \times C7ii - D1 \times D16ii}{C1 - D1}$
%OC Particip.	13.4%	17.73%	$\frac{C1 \times C7i - D1 \times D16i}{C1 - D1}$
%Pop. Inform.	22.88%	21.67%	C6ii
%Pop. Particip.	19.39%	19.08%	C6i
%FW	5.32%	21.4%	C19
Pr(Stocks>0)	0.217	–	C19
Perc. R	3.6%	5.1%	C42
Expec. R	1.6%	2.3%	C39
Actual R	$> 30\%$	–	*Yahoo Finance*

Appendix: Mean/Median Responses to Expec.R. and Perc.R. Questions

VARIABLES	# Obs.	Mean	Median	St. Dev.	Min	Max
Expec. R	2,535	1.62	-	8.944	-62.5	62.5
SD Expec. R	2,535	6.699	-	7.082	0	38.75
Perc. R	2,328	3.607	-	12.04	-37.5	37.5
SD Perc. R	2,328	6.649	-	7.171	0	31.15

Table: Questions C39 and C42, TNS 2014. Summary Statistics.

Appendix: Histograms of Mean and St.Dev. of Expec.R.

Histograms of Mean and St.Dev. of Subjective Expectations of Returns; question C39 TNS2014

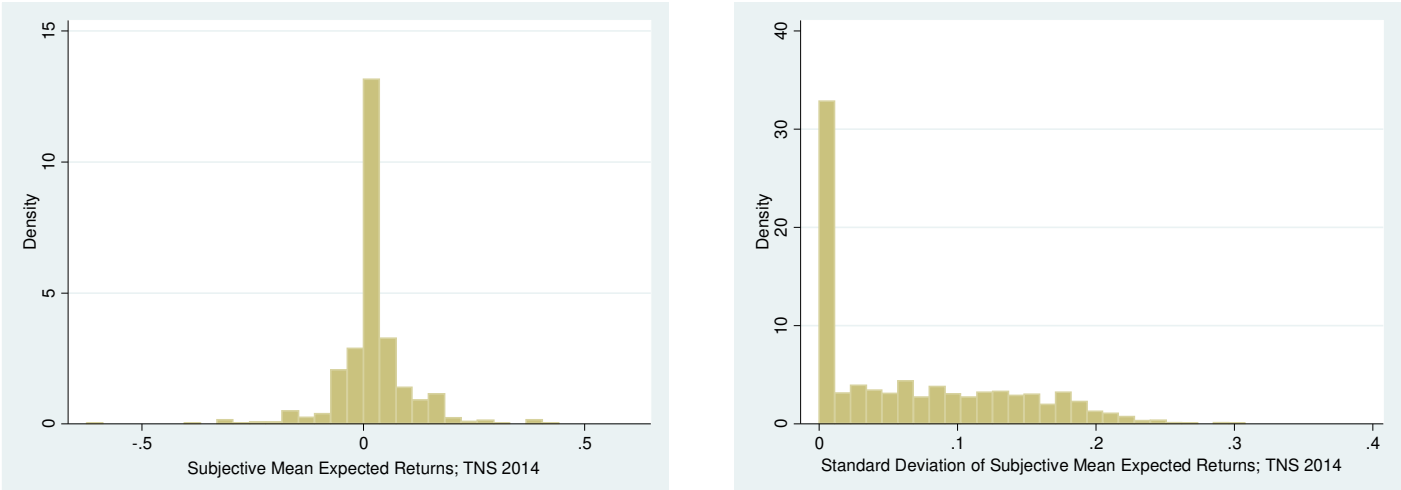


Figure 1a: Histograms of the subjective mean (left panel) expected five-year ahead cumulative return, and its standard deviation (right panel); TNS2014.

Appendix: Histograms of Mean and St.Dev. of Perc.R.

Histograms of Mean and St.Dev. of Subjective Perceptions of Returns; question C42 TNS2014

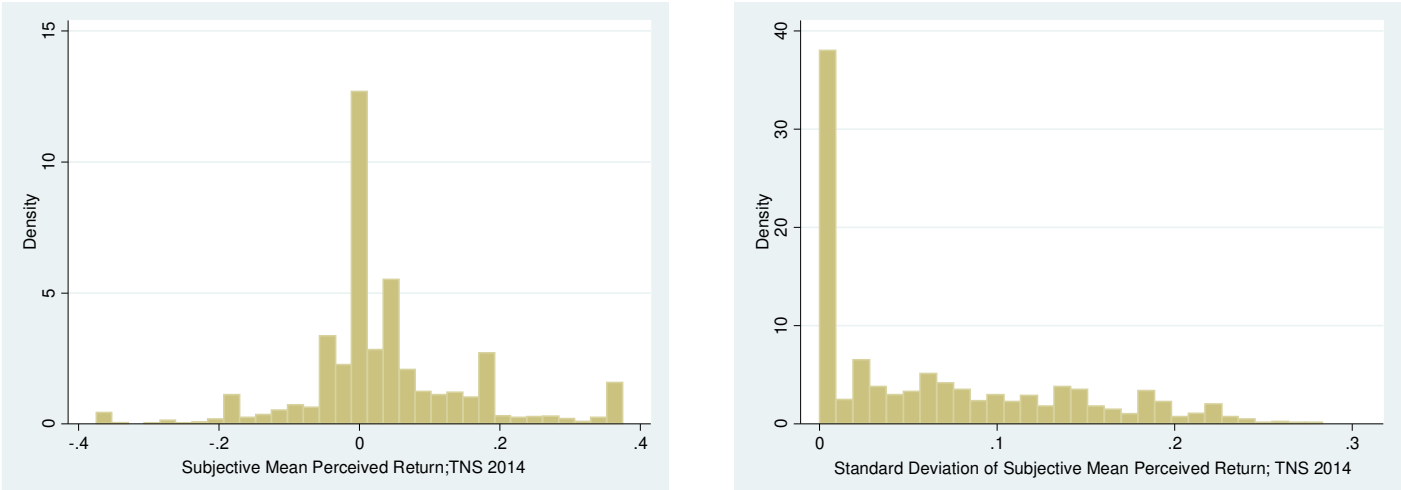


Figure 1b: Histograms of the subjective mean (left panel) perceived three-year cumulative realized return, and its standard deviation (right panel); TNS2014.

Appendix: Placebo Tests on Pure Information Stockholding

	Pr(Stocks>0)	%FW	Pr(Stocks>0) *Placebo*	%FW *Placebo*
% FC Inform.	0.00267***	0.0289	0.000934	0.0200
	(0.000588)	(0.0197)	(0.000666)	(0.0210)
% OC Inform.	0.000234	0.0409	0.000922	-0.00924
	(0.00132)	(0.0419)	(0.00120)	(0.0372)
% Pop. Inform.	n.s.	n.s.	n.s.	n.s.
Expec R	0.00201**	0.104***	0.00224**	0.0975***
	(0.000958)	(0.0352)	(0.00102)	(0.0329)
Risk aversion	-0.00415**	-0.108*	-0.00418**	-0.0921*
	(0.00187)	(0.0600)	(0.00181)	(0.0543)
Rel. Stand. Pref.	n.s.	n.s.	n.s.	n.s.
Controls	*Yes*	*Yes*	*Yes*	*Yes*
Log-likelihood	-1192	-3623	-1193	-3617
LR χ^2 (p-value)	445.0 (0)	398.5 (0)	492.3 (0)	399.7 (0)
Pseudo-R^2	0.175	0.052	0.170	0.052
Observations	2,525	2,294	2,506	2,277

Appendix: Placebo Tests on Selective Imitation Stockholding

	Pr(Stocks>0)	%FW	Pr(Stocks>0) *Placebo*	%FW *Placebo*
% FC Particip.	0.00217***	0.0325*	0.000855	0.0169
	(0.000649)	(0.0192)	(0.000696)	(0.0209)
% OC Particip.	0.00246*	0.0791**	0.000694	-0.0358
	(0.00127)	(0.0402)	(0.00129)	(0.0401)
% Pop. Particip.	n.s.	n.s.	n.s.	n.s.
Expec R	0.00195**	0.106***	0.00223**	0.0931***
	(0.000934)	(0.0368)	(0.00102)	(0.0320)
Risk aversion	-0.00396**	-0.107*	-0.00403**	-0.084
	(0.00180)	(0.0624)	(0.00183)	(0.0529)
Rel. Stand. Pref.	n.s.	n.s.	n.s.	n.s.
Controls	*Yes*	*Yes*	*Yes*	*Yes*
Log-likelihood	-1194	-3629	-1195	-3616
LR χ^2 (p-value)	434.6 (0)	403.3 (0)	489.7 (0)	402.5 (0)
Pseudo-R^2	0.174	0.0528	0.170	0.0527
Observations	2,525	2,294	2,506	2,277

Appendix: Selection of FC (I)

- Main concern: respondents who intend to invest in the stock market, choose within their social circles the peers with whom to discuss their own financial matters (FC).
- Therefore, we treat group choice and behaviour within a group as a set of (potentially correlated) joint outcomes (Blume et al., 2011, 2015), as follows
  - We separately model the choice of a financial circle, $\Pr(FC_i > 0)$, within the respondents' social circle on the basis of peer stock market information, $\%SCInform.$, and participation, $\%SCParticip.$, that may occur, and the individual choice to hold stocks

$$\begin{cases} \Pr(FC_i > 0) = \Phi(\nu_1' k^*_{iS\,\mathrm{Ci}} + \nu_2' k^*_{iSCp} + \nu_3' Expec\ R_i + \boldsymbol{\tau}_i \boldsymbol{\nu}') \\ \Pr(Stocks_i > 0) = \Phi(\lambda_0 + \lambda_1 k^*_{iFC} + \lambda_2 k^*_{iOC} + \lambda_3 Expec\ R_i + \boldsymbol{\tau}_i \boldsymbol{\lambda}) \end{cases}$$

  - *If* u_i and ν_{iFC} are correlated, $u_i = \rho \nu_{iFC} + v_i$, *then* we should reject H_o: $\rho = 0$

	$Pr(Stocks_i>0)$	$Pr(FC_i>0)$	$Pr(Stocks_i>0)$	$Pr(FC_i>0)$
% FC Inform.	0.00260***			
	(0.000606)			
% OC Inform.	0.000390			
	(0.00131)			
% SC Inform.		0.00340**		0.00335**
		(0.00150)		(0.00148)
% FC Partic.			0.00222***	
			(0.000666)	
% OC Partic.			0.00263**	
			(0.00129)	
% SC Partic.		-0.000711		-0.000677
		(0.00151)		(0.00149)
% Pop. Inform.	n.s.	n.s.		n.s.
% Pop. Partic.		n.s.	n.s.	n.s.
Rel. Stand. Pref.	n.s.	n.s.	n.s.	n.s.
Controls	Yes		Yes	
Log-likelihood	-1789		-1790	
LR χ^2 (p-value)	637.6 (0)		640.6 (0)	
rho	0.0346		0.0415	

Appendix: Selection of FC (II)

- We model the choice of a financial circle, $g = FC$, based on an overall respondent specific quality measure for each group, i.e.

$$Q_{ig} = \nu_1 k^*_{ig} + \boldsymbol{\tau}_i \nu + \nu_{ig}.$$

- If $g = \{FC, OC\}$, i chooses $\max_g Q_{ig}$ on the basis of only the expected average peer stock market information (or participation) that may occur, $k^*_{ig} = \{\%\ g\ Inform., (\%\ g\ Particip.)\}$, then $\Pr(FC_i > 0) = \Pr(Q_{iFC} - Q_{iOC} \geq 0)$:

$$\begin{cases} \Pr(FC_i > 0) = \Phi(\nu'_1[k^*_{iFC} - k^*_{iOC}] + \nu'_2 Expec\ R_i + \nu'_3 RA_i + \boldsymbol{\tau}_i \boldsymbol{\nu}') \\ \Pr(Stocks_i > 0) = \Phi(\lambda_0 + \lambda_1 k^*_{iFC} + \lambda_2 Expec\ R_i + \lambda_3 RA_i + \boldsymbol{\tau}_i \boldsymbol{\lambda}) \end{cases}$$

- Again, IF u_i and $\nu_{iFC} - \nu_{iOC}$ correlated, $u_i = \rho(\nu_{iFC} - \nu_{iOC}) + v_i$, THEN we should reject H_o: rho=0.

	$Pr(Stocks_i>0)$	$Pr(FC_i>0)$	$Pr(Stocks_i>0)$	$Pr(FC_i>0)$
% FC Inform.	0.00253***			
	(0.000567)			
% OC Inform.	-			
% SC Inform.		0.00343**		0.00337**
		(0.00150)		(0.00149)
% FC Partic.			0.00279***	
			(0.000605)	
% OC Partic.			-	
% SC Partic.		-0.000745		-0.000713
		(0.00152)		(0.00150)
% Pop. Inform.	n.s.	n.s.		n.s.
% Pop. Partic.		n.s.	n.s.	n.s.
Rel. Stand. Pref.	n.s.	n.s.	n.s.	n.s.
Controls	Yes		Yes	
Log-likelihood	-1789		-1790	
LR χ^2 (p-value)	637.6 (0)		640.6 (0)	
rho	0.0346		0.0415	
Wald $\chi^2(1)$ H_o:rho=0	0.420		0.612	
p-value $\chi^2(1)$	0.517		0.434	

Appendix: Robustness of Pure Information...

...to alternative treatments of inconsistent answers (IC)

	Most Conservative	Conservative		Least Conservative	
	%FW	% FW	%FW	% FW	%FW
% SC Inform.		0.0722**		0.0761**	
		(0.0299)		(0.0297)	
% FC Inform.	0.0293		0.0361*		0.0381*
	(0.0216)		(0.0202)		(0.0204)
% OC Inform.	0.0291		0.0235		0.0212
	(0.0408)		(0.0403)		(0.0386)
Expec R	10.55***	10.22***	10.46***	10.46***	10.78***
	(3.67)	(3.445)	(3.667)	(3.522)	(3.770)
RA	-0.120**	-0.112**	-0.117**	-0.121**	-0.124**
	(0.0606)	(0.0571)	(0.0586)	(0.0609)	(0.0641)
Controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Log-likelihood	-3634	-3635	-3633	-3635	-3633
LR χ^2 (p-value)	375.9 (0)	373.1 (0)	377.3 (0)	373.8 (0)	377.3 (0)
Observations	2,294	2,294	2,294	2,294	2,294

Appendix: Robustness of Selective Imitation...

...to alternative treatments of Inconsistent answers (IC)

	Most Conservative	Conservative		Least Conservative	
	%FW	% FW	%FW	% FW	%FW
% SC Particip.		0.0766**		0.0878***	
		(0.0306)		(0.0306)	
% FC Particip.	0.0308		0.0507**		0.0506**
	(0.0599)		(0.0220)		(0.0219)
% OC Particip.	0.0657		0.0484		0.043
	(0.0431)		(0.0424)		(0.0423)
Expec R	11.14***	10.71***	11.04***	10.63***	11.02***
	(3.909)	(3.603)	(3.900)	(3.608)	(3.887)
RA	-0.124*	-0.118**	-0.117**	-0.121**	-0.124**
	(0.0642)	(0.0591)	(0.0586)	(0.0609)	(0.0641)
Controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Log-likelihood	-3634	-3636	-3632	-3635	-3632
LR χ^2 (p-value)	375.7 (0)	372.1 (0)	379.3 (0)	374.1 (0)	379.3 (0)
Observations	2,294	2,294	2,294	2,294	2,294

Appendix: Is it what peers do or how informed they are?

Effect on Stockholdings

VARIABLES	(1) Pr(Stocks$_i$>0)	(2) Pr(Stocks$_i$>0)	(3) Pr(Stocks$_i$>0)
% FC Particip.	0.00646***		0.00573*
	(0.00194)		(0.00316)
% FC Inform.		0.00535***	0.000810
		(0.00179)	(0.00298)
% OC Particip.	0.00298		0.00276
	(0.00327)		(0.00441)
% OC Inform.		0.00225	0.000239
		(0.00317)	(0.00442)
Perc. R	0.851***	0.863***	0.847***
	(0.251)	(0.250)	(0.250)
Controls	Yes	Yes	Yes
LR χ^2 (p-value)	428.03(0)	432.81(0)	434.45(0)
Pseudo R^2	0.1516	0.1513	0.1528
Observations	3,670	3,670	3,670

Appendix: Additional Evidence of Pure Information

1. Perceptions of returns (proxy for how informed respondents are) are more in line with available data the more/better 'connected' individuals are: higher number of informed peers in FC associated with perceived return closer to the true return (i.e. better informed individual);
2. We decompose the effect of social interactions on stockholdings by the 'net balance in the flow of information' given to and received from those with whom the respondent exchanges on her/his own financial matters (% *FC Inform.*), to find that most of the effect comes from 'balanced' and 'net receiver' information exchanges at both margins;

Pr(Holding stocks dir. or indir. > 0)		
% FC Inform.	0.00844***	
	(0.00177)	
(% FC Inform.)*(Inform to = Informed from)		0.00941***
		(0.00245)
(% FC Inform.)*(Inform to $>$ Informed from)		0.00682***
		(0.00240)
(% FC Inform.)*(Inform to $<$ Informed from)		0.00808**
		(0.00332)
% OC Inform.	0.00126	0.00228
	(0.00317)	(0.00312)
No FC		-0.0252
		(0.0844)
Controls	*Yes*	
Log-likelihood	-1203	-1200
LR χ^2 (p-value)	422.7	448.3
Pseudo R^2	0.168	0.170
Observations	2,525	2,525

Pr(Holding stocks dir. or indir. > 0)		
% FC Particip.	0.00783***	
	(0.00195)	
(% FC Particip.)*(Inform to = Informed from)		0.0113***
		(0.00276)
(% FC Particip.)*(Inform to $>$ Informed from)		0.00542**
		(0.00253)
(% FC Particip.)*(Inform to $<$ Informed from)		0.00770**
		(0.00355)
% OC Particip.	0.00684**	0.00780**
	(0.00333)	(0.00340)
No FC		-0.0534
		(0.0835)
Controls		
Log-likelihood	-1202	-1201
LR χ^2 (p-value)	435.4	441.9
Pseudo R^2	0.168	0.169
Observations	2,525	2,525

E(% Fin.Wealth in Stocks|Hold. Stocks > 0)		
% FC Particip.	0.150**	
	(0.0599)	
(% FC Particip.)*(Inform to = Informed from)		0.139*
		(0.0811)
(% FC Particip.)*(Inform to $>$ Informed from)		0.109
		(0.0804)
(% FC Particip.)*(Inform to $<$ Informed from)		0.0739
		(0.107)
% OC Particip.	0.147	0.171
	(0.105)	(0.106)
No FC		0.249
		(2.697)
Controls	*Yes*	
Log-likelihood	-3634	-3634
LR χ^2 (p-value)	376.3	375.7
Pseudo R^2	0.0492	0.0491
Observations	2,294	2,294

E(% Fin.Wealth in Stocks|Hold. Stocks > 0)		
% FC Inform.	0.142**	
	(0.0575)	
(% FC Inform.)*(Inform to $=$ Informed from)		0.115
		(0.0750)
(% FC Inform.)*(Inform to $>$ Informed from)		0.134*
		(0.0785)
(% FC Inform.)*(Inform to $<$ Informed from)		0.124
		(0.105)
% OC Inform.	0.00784	0.0214
	(0.100)	(0.0999)
No FC		0.659
		(2.732)
Controls	*Yes*	
Log-likelihood	-3632	-3633
LR χ^2 (p-value)	379.5	378.0
Pseudo R^2	0.0497	0.0495
Observations	2,294	2,294

MODEL (I)

- Large discrete number of agents n
- Two assets, one risky (stock) and one riskless (bond)
- The payoff of the riskless asset is 1
- The payoff of the risky asset follows a normal distribution $X \sim N(\bar{X}, \sigma^2)$ and its price is p
- Supply of stocks is random and is given by $Z_n = nZ$, where $Z \sim N(\bar{Z}, \Delta^2)$ and $\bar{Z} > 0$
- Agents have CARA preferences over final wealth ω_i and solve

$$\max_{D_i} \mathbb{E}\left[-e^{-\rho_i \omega_i} \middle| \mathcal{I}_i\right]$$

$$s.t. \quad \omega_i = \omega_{0i} + D_i (X - p)$$

- To find the optimal demand D_i^* that maximizes expected utility, given their information set $\mathcal{I}_i$

$$D_i^* = \frac{1}{\rho_i} \frac{\mathbb{E}\left[(X - p) | \mathcal{I}_i\right]}{Var\left[X | \mathcal{I}_i\right]}$$

MODEL (II)

Investors' information

- What is contained in $\mathcal{I}_i$?
- Price p and signals
- Each agent observes an individual, private signal about the return on the risky asset $y_i = X + \epsilon_i$, $\epsilon_i \sim N(0, s_i^2)$
- Two networks:
  1. Acquaintances: adjacency matrix A, with $a_{ij} \in \{0, 1\}$
  2. Information network: adjacency matrix G, with $g_{ij} = a_{ij}/s_j^2$, where s_j^{-2} is signal precision of agent j
- The pooled payoff signal is

$$x_i = \frac{\sum_{k=1}^{n} g_{ik} y_k}{\sum_{k=1}^{n} g_{ik}} = X + \frac{\sum_{k=1}^{n} g_{ik} \epsilon_k}{\sum_{k=1}^{n} g_{ik}}$$

- Because n is large, no incentives to hide information (private signals) from one's friends

Mechanism: Perceptions

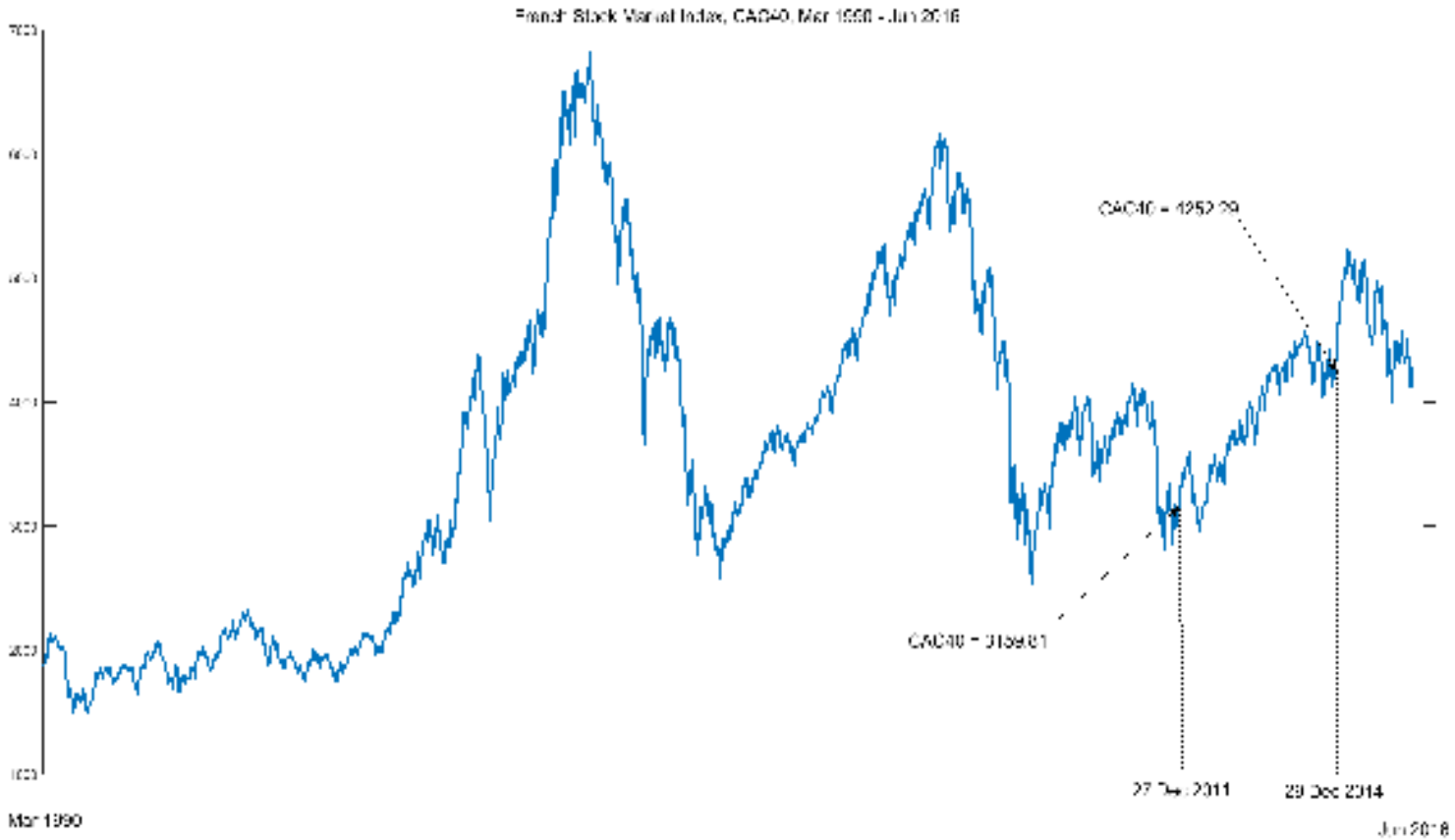


Figure: French stock market index, CAC 40, weekly data, 3 March 1990 - 27 June 2016. Source: Yahoo Finance.

Mechanism: social interactions effect on own information?

- Does talking to optimists make you more optimistic?
  No: Talking to informed peers makes you better informed about *facts*
- Relevant fact No.2 $\approx$ the historical standard deviation of stock returns *StDev* $R_t(5)$ is around 0.19 in France (Dimson et al. (2008) or Le-Bris and Hautcoeur (2010) from long-run series).
- We elicit probabilistically respondents' expectations and compute the standard deviation of $ER_{t+1}(5)$ for each individual, denoted '*StDev* ER_i'. Cross-sectional sample mean is 0.067, i.e. the average respondent has a **risk perception gap** which *underestimates the truth* by around *three times*.
- We therefore examine whether a larger share of informed peers *reduces* the 'perception gap', as follows:

$$StDev\ ER_i = v_0 + \underset{(+)}{v_{1,FC}\, k^*_{i,FC}} + \underset{(0)}{v_{1,OC}\, k^*_{i,OC}} + \mathbf{w}_i \boldsymbol{v} + \omega_i$$

- A 1StDev increase in informed peers (about 1 additional informed person) *reduces the risk perception gap* by +0.7 p.p. (by 10% relative to the *unconditional mean* risk of +6.7%);

Mechanism: Social interactions effect on risk perception

	StDev ER	StDev ER	StDev ER	StDev ER
% FC Inform.			0.0256***	
			(0.00971)	
% OC Inform.			0.00670	
			(0.0157)	
% Pop. Inform.	n.s.	n.s.	n.s.	
% FC Particip.				0.0223**
				(0.00983)
% OC Particip.				0.00473
				(0.0194)
% Pop. Particip.	n.s.	n.s.		n.s.
StDev. R.		0.647***	0.647***	0.647***
		(0.0186)	(0.0186)	(0.0186)
Rel. Stand. Pref.	n.s./(.)**	n.s./(.)*	n.s./(.)*	n.s./(.)*
Controls	*Yes*	*Yes*	*Yes*	*Yes*
$F\ (p-value)$	2.658 (0)	35.49 (0)	34.54 (0)	33.95 (0)
R^2	0.0476	0.461	0.464	0.463
Observations	2,535	2,173	2,173	2,173

Appendix: Policy implications

- Socially interacting with informed peers 'improves' own subjective Sharpe ratios, ...by levelling up respondents' (scant) information with publicly available data
  - $\Longrightarrow$Public information provision of relevant facts: risk/returns on (alternative) investments, interest rates, inflation, etc. but also on professional forecasters' forecasts?
- Expectations have a substantial effect on stockholdings (e.g. Dominitz and Manski, 2007)
  - $\Longrightarrow$Systematic collection of expectations data: Survey of Consumer Expectations... ?
- Evidence supports an overall positive effect of **informative social interactions**
  - $\Longrightarrow$'Investment clubs' need not just be 'echo-chambers', may actually contribute towards the spread of factual information relevant for sound financial decision taking (or, they could be 'capped')