The Effect of Past Experiences on Preferences and Beliefs

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Paper 1: Depression Babies: Do Macroeconomic Experiences Affect Risk-Taking?

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"I don't know about you, but my parents were depression babies, and as a result, avoided the stock market and all things risky like the plague."

Source: moneytalks.org ("Investing: The Basics")

Motivation

- Traditional models in economics:
  - Exogenously endowed and stable preferences
  - Personally experienced / witnessed outcomes do not affect beliefs differently from information about these outcomes.
- Psychology and experimental economics literature:
  - Experience-weighted (in particular, reinforcement) learning versus information (Camerer and Ho, Econometrica 1999)
  - Learning from personal interaction (with other players) stronger than from observing other players' behavior (Simonsohn, Karlsson, Loewenstein, and Ariely, 2007)
  - Endogenous preference formation (Bowles, JEL 1998; Palacios-Huerta and Santos, JPubE 2004).
  - Social learning and personal advice (Schotter, AER 2003)

Motivation

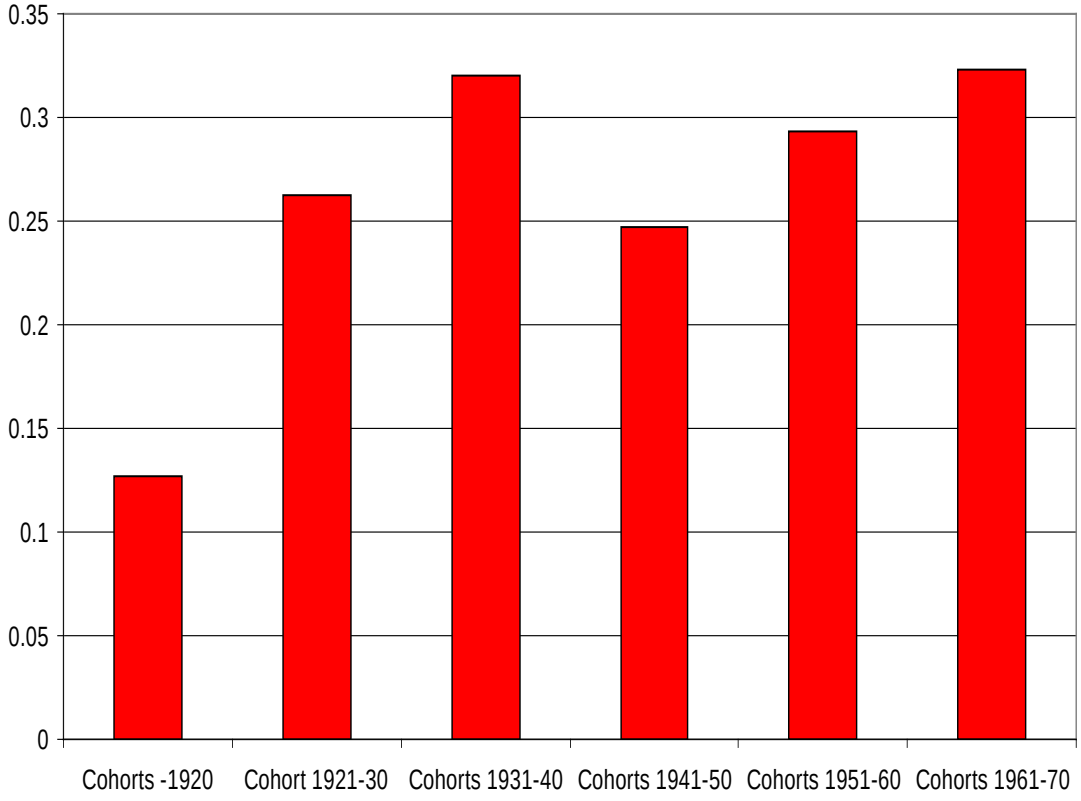
- ➔ Do individuals' "histories" systematically affect their decision-making differently than information about the historical outcomes?
- ➔ For the generation of "Depression Babies" it has often been suggested that their experience of a large macro-economic shock had a long-lasting effect on their attitudes towards risk.

Our application: We ask more generally whether people who live through different macroeconomic histories make different risky choices.

Application:
Financial decision-making and risk-taking

- Does stock-market experience affect risk attitudes and stock inv.?
- Does inflation experience affect bond investment?

Illustration: stock-market participation at age 36-45



Data

- Survey of Consumer Finances
  - 1983-2004: Triennial, cross-sectional, household-level
  - Oversampling of high-income households
  - Detailed data on asset holdings and demographics
- Precursor of Survey of Consumer Finances
  - 1964-1977: 1964, 1968, 1969, 1970, 1971, 1977
  - We use data on stock-market participation.

Measures of Risk-Taking

- **Elicited risk aversion** (1983-2004): survey
  - 1 = "willing to take substantial financial risks expecting to earn substantial returns"
  - 2 = "… above average financial risks .. above av. ret."
  - 3 = "…average financial risks … average returns"
  - 4 = "not willing to take any financial risk"
- **Stock investment** I (1964-2004)
  - Stock-market participation (stock holdings > $0)
- **Stock investment** II (1983-2004)
  - Risky asset share of stock-market participants (% of liquid assets in stocks)
- **Bond investment** (1983-2004)
  - Bond share of bond mkt. participants (% of non-stock liquid assets invested in bonds)

Measures of Experienced Returns

- $R_{i,t-k}$: Annual real returns on S&P500 index from Shiller (2005)
- Calculate since birth of household head
- Life-time (weighted) average returns of household *i* at *t*:

$$A_{it}(\lambda) = \frac{\sum_{k=1}^{age_{it}-1} w_{it}(k,\lambda) R_{t-k}}{\sum_{k=1}^{age_{it}-1} w_{it}(k,\lambda)}, \text{ where } w_{it}(k,\lambda) = \left(\frac{age_{it} - k}{age_{it}} \right)^{\lambda}$$

Weighting Function

- Chosen to allow increasing, decreasing, constant weights over time with one parameter.
- Illustration for 50-year old household:

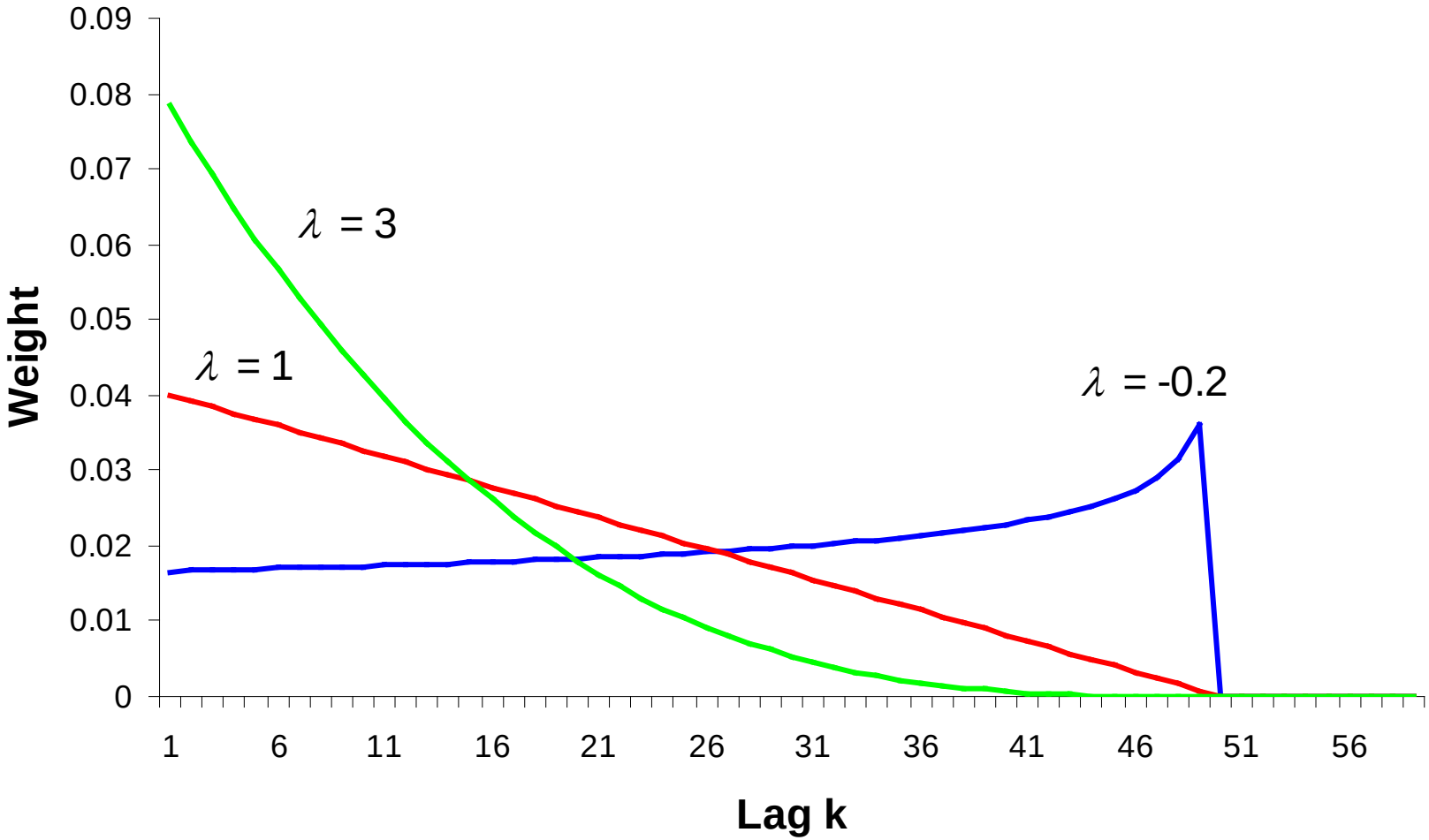


Table I: Summary Statistics

	10 %	Median	90 %	Mean	Stddev	N
Panel A: All households 1964 – 2004						
Liquid assets	800	12,372	216,060	122,909	726,749	33,955
Income	16,430	48,475	109,705	65,457	177,594	33,955
Life-time avg. stock ret. (λ = 1.25)	0.059	0.087	0.110	0.086	0.021	33,955
Life-time avg. inflation (λ = 1.00)	0.023	0.042	0.055	0.039	0.012	33,955
Stock mkt. participation	0	0	1	0.286	0.452	33,955
Panel B: All households 1983 – 2004						
Liquid assets	745	13,245	167,187	107,953	895,198	24,914
Income	16,422	48,674	121,526	71,833	226,353	24,914
Life-time avg. stock ret. (λ = 1.25)	0.054	0.076	0.103	0.079	0.020	24,914
Life-time avg. inflation (λ = 1.00)	0.041	0.048	0.058	0.048	0.006	24,914
Stock mkt. participation	0	0	1	0.285	0.452	24,914
% Liquid assets in stocks	0	0	0.551	0.120	0.250	24,914
% Non-stock liquid assets in bonds	0	0	0.176	0.056	0.161	24,914
Risk aversion	2	3	4	3.126	0.834	22,537

Table I: Summary Statistics (*continued*)

	10 %	Median	90 %	Mean	Stddev	N
Panel C: Stock-market participants 1983 – 2004						
Liquid assets	7,780	65,200	539,606	297,979	1,624,036	10,481
Income	29,391	75,654	202,645	121,553	401,129	10,481
% Liquid assets in stocks	0.044	0.378	0.878	0.421	0.303	10,481
% Non-stock liquid assets in bonds	0	0	0.347	0.090	0.199	10,481
Risk aversion	2	3	4	2.792	0.776	9,702
Panel D: Bond market participants 1983 – 2004						
Liquid assets	2,939	30,399	359,625	208,943	1,354,162	8,208
Income	27,152	65,748	159,166	98,919	315,101	8,208
% Liquid assets in stocks	0	0	0.626	0.164	0.262	8,208
% Non-stock liquid assets in bonds	0.005	0.090	0.632	0.208	0.254	8,208
Risk aversion	2	3	4	3.003	0.801	7,443

Estimation

- General approach:

$$y_{it} = \alpha + \beta A_{it}(\lambda) + \gamma' x_{it} + \varepsilon_{it}$$

  - $A_{it}(\lambda)$: Life-time (weighted) average returns or inflation of household *i* at time *t*, given weighting parameter λ
  - x_{it}: Control variables
  - β: Partial effect of life-time average returns or inflation on dependent variable (coefficient of main interest)
- We estimate β and λ simultaneously.
- Non-linear estimation

Identification

1. True "experience" of returns / inflation differs
   - Depends on investment
   - Depends on interest in economic matters
   - Depends on other personal circumstances

   – Bias?
   - Only if such idiosyncratic factors are correlated with the aggregate return / inflation measures. Else noise.
2. Unobserved aggregate effects explaining both stock returns and (aggregate) investment

   – E.g. time effects

   – E.g. time-varying aggregate risk aversion

   ➔ Include year dummies

   ➔ The identification from cross-sectional *differences* in risk-taking and in macroeconomic histories **and** from changes of those cross-sectional differences over time, not from *common* variation over time.

Example

- In the early 1980s, young households had lower rates of stock-market participation, lower allocation to stocks, and reported higher risk aversion than older households.
  - Young households experienced the low 1970s stock returns.
  - Older households also experienced the low 1970s stock-market returns, but their life-time experience included the high returns of the 1950s and 1960s.
- In the 1990s, pattern flipped: (then) young households had higher rates of stock-market participation, higher allocation to stocks, and lower reported risk aversion than older households.
  - Young households experienced the 1990s boom years
  - Young households had higher life-time average returns than old households.

➔ Our identification comes from these correlated changes in the age profile of life-time weighted average returns and risk-taking.

Identification Issues

3. Age effects
   - Older consumers may reduce risky-asset share

   ➔ Third-order polynomial in age or age dummies

4. Demographics

   ➔ Household-level regressions with wealth and income controls (liquid assets, liquid assets^2, income, income^2), education, retirement, marital status, race dummies as controls

5. Unobserved wealth effects correlated with both experienced stock returns and risk aversion

   ➔ Analysis of stock market and bond market

Identification – Previous Literature

- Emphasis of previous work:
  - Effect of age on individual investment, controlling for cohort fixed effects but (to avoid collinearity) not controlling for time effects. (Poterba, 2001)
  - Identify cross-cohort differences in risk-taking, controlling for cohort fixed effects, e.g., Ameriks and Zeldes (2004).
- Problem: Cohort effects cannot be separated from age and time effects, due to the collinearity of age, time, and cohort (see, e.g., Heckman and Robb 1985, and the discussion in Campbell, 2001).
- Our analysis: hypothesis of a *specific*, signed relationship between macroeconomic experiences and risk-taking.
  - ➔ Analysis does not require to estimate cohort effects.
  - ➔ Can included age and year effects.
  - ➔ Can even include cohort, age, and year effects "up to one."

Measure 1: Elicited Risk Aversion

- Ordered Probit Model (ML estimation)

$$\mathrm{P}\left(y_{it} \le j \mid x_{it}, A_{it}\left(\lambda\right)\right) = \Phi\left(\alpha_j - \beta A_{it}\left(\lambda\right) - \gamma' x_{it}\right)$$

- Risk aversion categories $j = \{1, 2, 3, 4\}$

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  - $A_{it}(\lambda)$: Life-time (weighted) average returns of household i at time t, given weighting parameter λ
  - x_{it}: Control variables

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- Risk aversion categories $j = \{1, 2, 3, 4\}$

  - Coefficient vector β has no direct economic interpretation.
  - We focus on <u>average partial effects</u> of life-time average return on probabilities of being a certain risk-aversion category.
  - Partial effect $\partial \mathrm{P}\left(y_{it} = j \mid x_{it}, A_{it}\left(\lambda\right)\right) / \partial A_{it}\left(\lambda\right)$
  - Average partial effect: evaluate the partial effects at each sample observation, given the estimated parameters and observations on x_{it} and $A_{it}(\lambda)$ and average across sample observations

Table II: Elicited Risk Aversion

	(i) 1983-2004	(ii) 1983-2004	(iii) 1983-2004 w/ SCF sample weights	(iv)1983-2004 w/ SCF sample weights
Ordered Probit coefficient estimates:				
Life-time average stock-market return coefficient β	-4.551	-4.387	-4.990	-4.734
	(1.015)	(1.017)	(1.197)	(1.203)
Weighting parameter λ	1.546	1.498	1.815	1.841
	(0.355)	(0.358)	(0.423)	(0.443)
Income controls	Yes	Yes	Yes	Yes
Liquid assets controls	-	Yes	-	Yes
Demographics controls	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Average partial effect				
Risk Aversion = 1	0.496	0.476	0.660	0.629
	(0.111)	(0.110)	(0.158)	(0.160)
Risk Aversion = 2	0.827	0.783	0.740	0.708
	(0.184)	(0.181)	(0.178)	(0.180)
Risk Aversion = 3	0.041	0.037	0.102	0.067
	(0.009)	(0.009)	(0.025)	(0.017)
Risk Aversion = 4	-1.364	-1.296	-1.503	-1.405
	(0.304)	(0.300)	(0.360)	(0.357)
#Obs.	22,537	22,537	22,537	22,537
Pseudo R^2	0.09	0.10	0.06	0.08

Interpretation

- Average partial effect:
  - Difference between the 10th and 90th percentile of life-time average stock returns is about 5.1%.
  - Change from the 10th to the 90th percentile implies about $-1.364 \times 5.1\% = -7.0\%$ decrease in the probability of being in the highest risk-aversion category.
- Weighting parameter λ (estimate 1.546, s.e. 0.355)
  - households' risk aversion affected by returns many years in the past.
  - declining weights; significantly different from equal / increasing weights: the memory of these early experiences fades away only very slowly.

Measure 2: Stock-Market Participation

- Probit Model (ML estimation)

$$\mathrm{P}\left(y_{it} \le j \mid x_{it}, A_{it}\left(\lambda\right)\right) = \Phi\left(\alpha_j - \beta A_{it}\left(\lambda\right) - \gamma' x_{it}\right)$$

- Binary indicator y_{it} = 1if positive stockholdings of household *i* at time *t*
  - As before, coefficient vector β has no direct economic interpretation.
  - We focus on <u>average partial effects</u> of life-time average return on stock market participation:
  - Partial effect: $\partial \mathrm{P}\left(y_{it} = 1 \mid x_{it}, A_{it}\left(\lambda\right)\right) / \partial A_{it}\left(\lambda\right)$
  - Average partial effect: Given the estimated β and λ, evaluate this partial effect at every sample observation and average across all observations

Table III: Stock-Market Participation (Probit)

	(i) 1964-2004	(ii) 1964-2004	(iii) 1964-1977	(iv) 1983-2004	(v) 1983-2004 w/wghts	(vi)1983-2004 w/wghts
Probit coefficient estimates:						
Life-time average stock-market return coefficient β	6.743	7.053	6.988	7.053	6.053	6.229
	(1.124)	(1.244)	(3.078)	(1.380)	(1.495)	(1.639)
Weighting parameter λ	1.290	0.994	1.076	1.190	1.049	0.992
	(0.212)	(0.184)	(0.708)	(0.280)	(0.373)	(0.363)
Income controls	Yes	Yes	Yes	Yes	Yes	Yes
Liquid assets controls	-	Yes	Yes	Yes	-	Yes
Demographics controls	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Average partial effect	1.929	1.719	1.773	1.682	1.579	1.401
	(0.322)	(0.303)	(0.781)	(0.329)	(0.390)	(0.369)
#Obs.	33,955	33,955	9,041	24,914	24,914	24,914
Pseudo R^2	0.24	0.35	0.26	0.38	0.17	0.29

Interpretation

- Average partial effect:
  - Difference between the 10th and 90th percentile of life-time average stock returns is about 5.1%.
  - Change from the 10th to the 90th percentile implies about $1.929 \times 5.1\% = 9.8\%$ increase in the probability of stock-market participation.
- Weighting parameter λ very similar

Measure 3: Risky-Asset Portion

- Non-linear regression:

$$y_{it} = \alpha + \beta A_{it}(\lambda) + \gamma' x_{it} + \varepsilon_{it}$$

- Conditional on stock-market participation.
- Partial effect $A_{it}(\lambda)$ is now = β.

Table IV: Risky Asset Share (NLS)

	(i) 1983-2004	(ii) 1983-2004	(iii) 1983-2004 w/ SCF sample weights	(iv) 1983-2004 w/ SCF sample weights
Life-time average stock-market return coefficient β	1.139	1.288	1.062	1.243
	(0.485)	(0.485)	(0.398)	(0.389)
Weighting parameter λ	0.967	0.934	0.843	1.428
	(0.058)	(0.061)	(0.055)	(0.080)
Income controls	Yes	Yes	Yes	Yes
Liquid assets controls	-	Yes	-	Yes
Demographics controls	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
#Obs.	10,481	10,481	10,481	10,481
R^2	0.07	0.08	0.09	0.10

Interpretation

- Average partial effect:
  - Difference between the 10th and 90th percentile of life-time average stock returns is about 5.1%.
  - Change from the 10th to the 90th percentile implies about 1.139 $\times$ 5.1% = 5.8 % increase in the proportion allocated to risky assets .
  - Noteworthy: In empirical literature on household portfolio choice that, it is hard to find *any* household characteristics among stock-market participants predicting the risky asset share.
- Weighting parameter λ very similar

Measure 4: Bond Share

- Hypothesis: past experiences of high inflation reduces willingness to hold bonds.
- Outcome variable: proportion of non-stock liquid assets invested in bonds.
- Non-linear regression:

$$y_{it} = \alpha + \beta A_{it}(\lambda) + \gamma' x_{it} + \varepsilon_{it}$$

- Conditional on stock-market participation.
- Partial effect $A_{it}(\lambda)$ is now = β.

Table V: Bond Share (NLS)

	(i) 1983-2004	(ii) 1983-2004	(iii) 1983-2004 w/ SCF sample weights	(iv) 1983-2004 w/ SCF sample weights
Life-time average inflation coefficient β	-2.727	-3.453	-3.866	-3.874
	(1.145)	(1.099)	(1.045)	(0.936)
Weighting parameter λ	1.008	1.051	0.790	0.965
	(0.061)	(0.055)	(0.034)	(0.036)
Income controls	Yes	Yes	Yes	Yes
Liquid assets controls	-	Yes	-	Yes
Demographics controls	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
#Obs.	8,208	8,208	8,208	8,208
R^2	0.12	0.16	0.03	0.10

Interpretation

- Average partial effect:
  - Difference between the 10th and 90th percentile of life-time average stock returns is about 1.7%.
  - Change from the 10th to the 90th percentile implies about $-2.727 \times 1.7\% = -4.6\%$ decrease in the proportion allocated to bonds.
- Weighting parameter λ very similar
  - Across stocks and bonds!
  - Across survey and investment measures!

  ➔ Suggests potential for a unified model.

Interpretation (II)

- Confirmation experience effect from stock-investment data in inflation-bond context.
- Helps to address leading alternative interpretation (i.e., that positive relationship between past stock returns and risk-taking is an unobserved wealth effect on risk-taking):
  - Stock returns positively related to wealth, but inflation? (Direction?)
  - Stock market returns and inflation little correlated (-0.14, insignificant, in our data since 1871).

Robustness Checks – and Ideas for your research

- Age dummies
- Cohort dummies
  - Identification issue in the literature: inclusion of age and year controls comes at the expense of not being able to estimate cohort dummies ➔ cannot estimate, separately, the impact of experienced stock returns and inflation and cohort effects.
  - Here: advantage of experience predicting a *specific*, signed relationship between experienced stock returns and investment in stock and another *specific*, signed relationship between experience inflation and investment in long-term bonds
  - Moreover: life-time average return and inflation variables vary not only across cohorts, but also within cohorts ➔ can identify within cohort

  ➔ Include cohort dummies "up to one"
- Flexible starting age
- More precise split of mutual funds and inclusion of retirement savings on data since 1989.

Robustness Checks – and Ideas for your research (II)

- Controlling for risk:
  - Do differences in life-time experiences of return volatility also lead to differences in risk-taking?
- Repeat Probit model
  - including life-time volatility of returns, measured by the standard deviation of returns since birth,
  - with observations weighted in the same way (with $\lambda = 1.00$) as for the life-time average return
- Small, insiginficant, negative coefficient.

  ➔ Unconditional mean of returns is harder to estimate than the second moment (Merton, 1980), hence presumably more scope for investors to disagree and be influence by life-time experiences of mean returns rather than volatility.

Aggregate Perspective

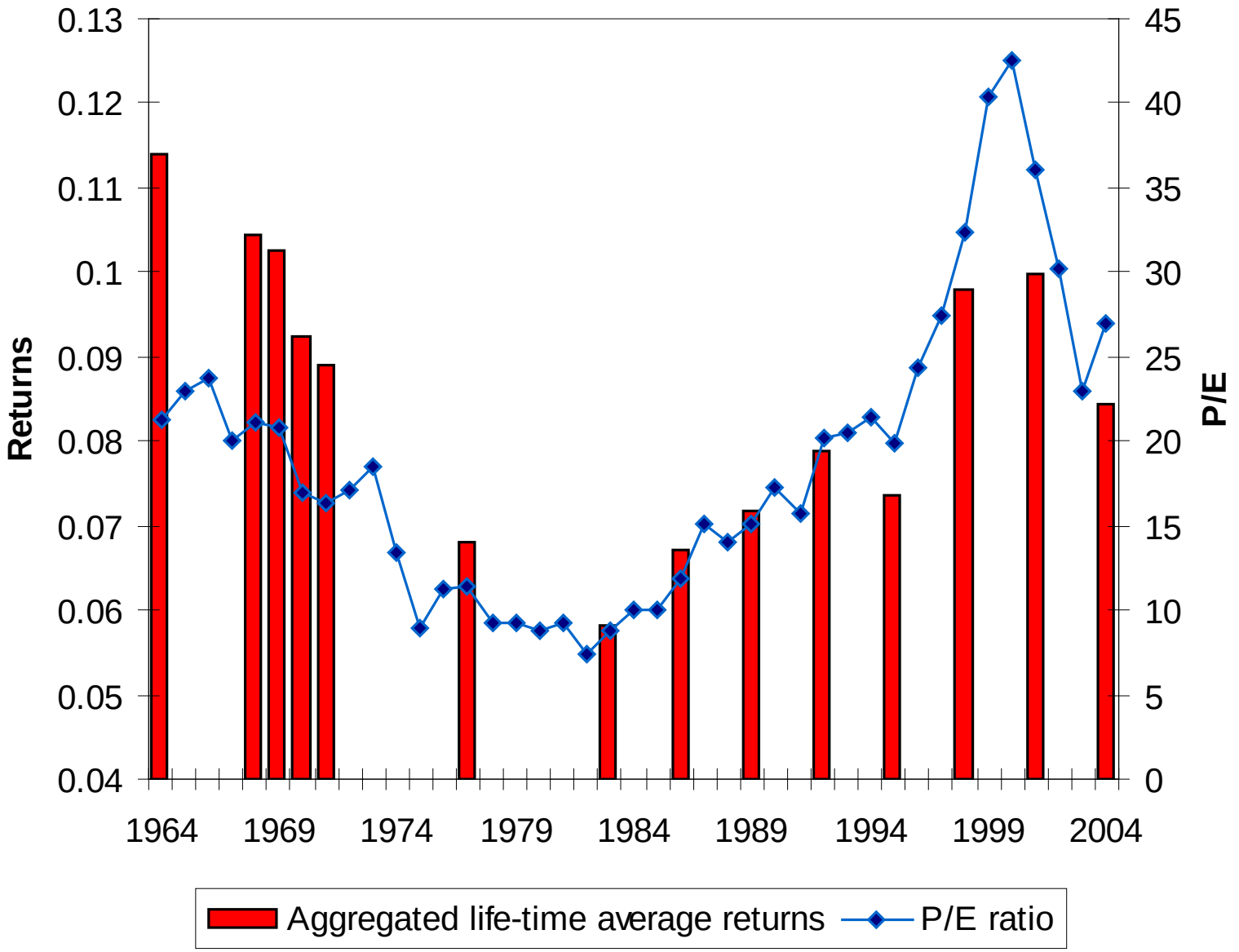
Do the experience-based changes in risky asset demand influence the dynamics of stock prices?

Exercise:

- Set λ=1.25 (in ballpark of prior estimates)
- Compute life-time (weighted) average return for each household and year
- Weight household-year observations with liquid assets of the household × SCF weight
- Relate to measure of stock market valuation:

  P/E ratio from Shiller (2005), which is negatively related to future stock-market returns

Figure 4


0.13
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Returns
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25
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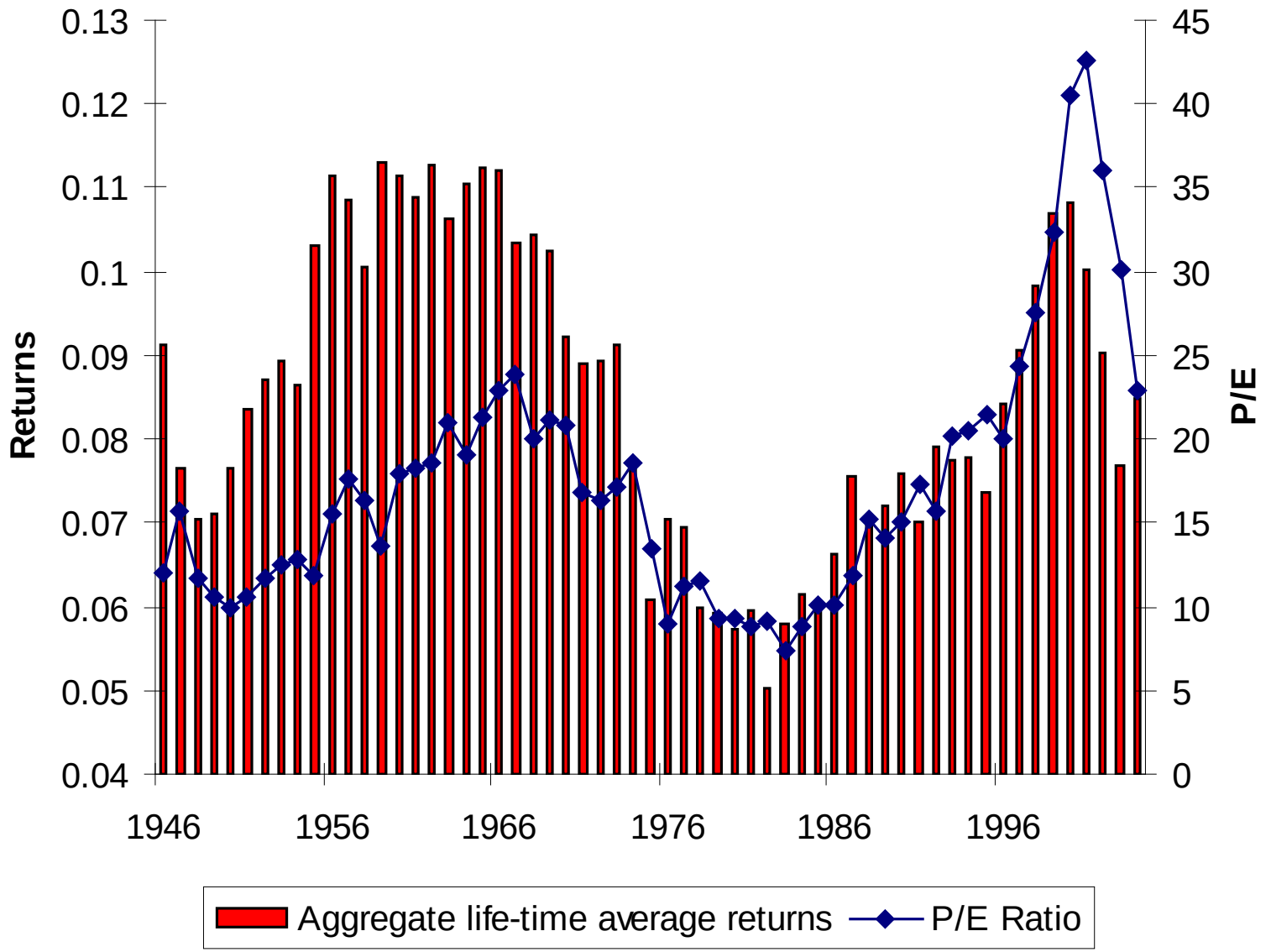
5
0
P/E
1964
1969
1974
1979
1984
1989
1994
1999
2004
Aggregated life-time average returns
P/E ratio

Figure 6


0.13
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Returns
45
40
35
30
25
20
15
10
5
0
P/E
1946
1956
1966
1976
1986
1996
Aggregate life-time average returns
P/E Ratio

Interpretation

- Highly positive correlation between aggregate life-time average returns and stock-market valuation levels.
- Implies:
  - Our microdata estimates imply plausible time-variation in aggregate demand for risky assets.
  - Personally experienced stock-market returns possibly affect equity valuation via changes in investors' willingness to take risk.

Conclusions

- **Findings**
  - Stock return experienced over an individuals' life affects risk attitudes and willingness to take financial risks in stocks
  - Inflation experience affects willingness to take inflation risk
  - Individuals put more weight on relatively recent returns (inflation), but even very distant ones still have substantial effects

➔Departure from standard model (stable risk attitudes)

➔Systematic departure, unified framework for different measures of risk-aversion.

Conclusions

- **Explanation**
  - Learning?
  - Social learning?
  - Endogenous risk aversion?
- **Implications**
  - Source of heterogeneity (contrast with standard learning model where all investors use the same historical data).
  - Potential explanation for variations in stock market valuation levels and expected returns over time.

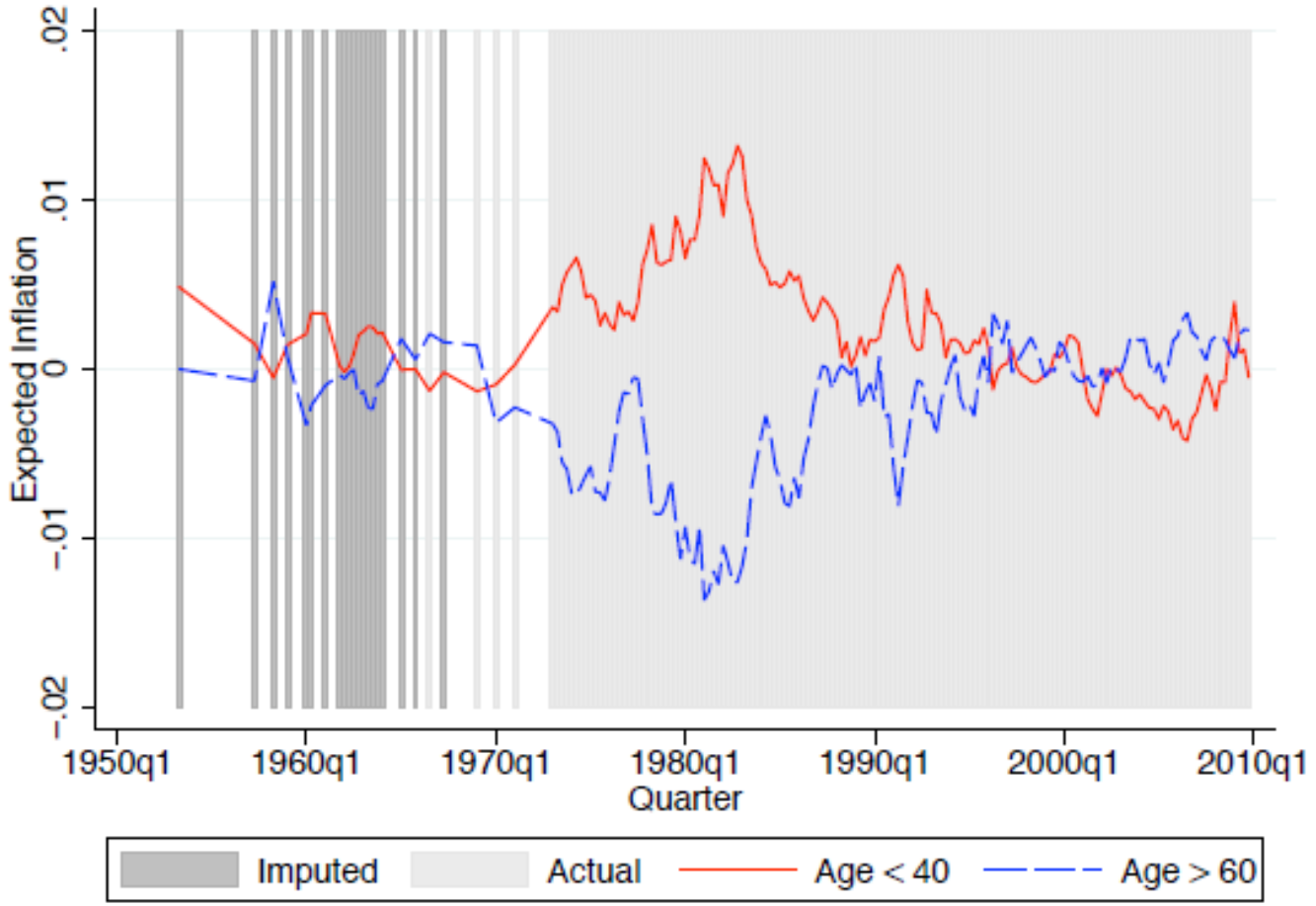
Follow Up I: Inflation

- Pins down “beliefs versus preferences” → Beliefs
- Confirms weighting parameter → Unified model
- Policy Implications: "A fuller understanding of the public's learning rules would improve the central bank's capacity to assess its own credibility, to evaluate the implications of its policy decisions and communications strategy, and perhaps to forecast ination." | Bernanke (2007)
  - Previously: little empirical evidence on people's actual forecasting rules

Results

- Individuals' inflation expectations differ depending on the characteristics of the inflation process experienced during their life times: helps explain the increased disagreement in late 1970s and early 1980s

Disagreement about future inflation (one-year horizon)



Inflation expectations of young and old relative to full-sample mean

Results

- Individuals' inflation expectations differ depending on the characteristics of the inflation process experienced during their life times: helps explain the increased disagreement in late 1970s and early 1980s
- Our results imply that individuals' perception of inflation persistence is close to zero right now, particularly for young individuals, i.e., expectations well “anchored.”

Follow Up II: Effect on Corporate Decisions

- Consider variation in managers' personal histories that is likely to generate differences in their financial decision-making.
  - Existing evidence suggests that individuals are most affected by seismic events early in life (see, e.g., Elder (1998)).
- We identify the two biggest shocks that are likely to be formative experiences and that affect a significant portion of our sample CEOs early in life:
  - Growing up during the Great Depression
  - Serving in the military.

Follow Up II: Effect on Corporate Decisions

- Experiencing the Great Depression induces less faith in external capital markets (Graham and Narasimhan (2004); Schoar (2007); Malmendier and Nagel (2008)).
  → Depression CEOs therefore lean excessively on internal financing.
- Military service during early adulthood and, particularly, combat exposure have a lasting effect on veterans' life-choices and decision making (Elder (1986); Elder and Clipp (1989); Elder, Gimbel, and Ivie (1991)) and induce agressiveness or risk-taking.

  → These traits may later manifest themselves in more aggressive capital structure choices.

Switching Gears to Other "Personal Traits"

- Overconfidence → main part of

Corporate Financial Policies with Overconfident Managers

- Ulrike Malmendier
- Geoffrey Tate
- Jun Yan

Corporate Finance

- **Investment**
- **Mergers & Acquisitions**
- **Capital Structure**

Three Puzzles

- **Investment**
- **Mergers & Acquisitions**
- **Capital Structure**

Three Puzzles

- **Investment**
  - Should depend only on investment opportunities (Tobin's Q)
  - Depends on internal cash flow (Investment-cash flow sensitivity)
  - Even for large firms with access to debt and equity markets
- **Mergers & Acquisitions**

- **Capital Structure**

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- **Investment**
  - Should depend only on investment opportunities (Tobin's Q)
  - Depends on internal cash flow (Investment-cash flow sensitivity)
  - Even for large firms with access to debt and equity markets
- **Mergers & Acquisitions**
  - U.S. firms spent more than $3.4 trillion on over 12,000 mergers during the last two decades.
  - Acquiring shareholders lost over $220 billion (net) at the announcement of merger bids from 1980 to 2001 (negative announcement effects).
  - Long-term returns appear to deepen the puzzle.
- **Capital Structure**

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  - Acquiring shareholders lost over $220 billion (net) at the announcement of merger bids from 1980 to 2001 (negative announcement effects).
  - Long-term returns appear to deepen the puzzle.
- **Capital Structure**
  - Pecking order of financing: Cash $\succcurlyeq$ Safe Debt $\succcurlyeq$ Risky Debt $\succcurlyeq$ Equity
  - Debt conservatism: Companies issue too little debt given the tax advantages (tax deductibility of interest payments)
  - …

Research Agenda

- **Traditional approach**:
  - Market characteristics (taxes, bankruptcy costs)
  - Industry characteristics (asset tangibility)
  - Firm characteristics (information asymmetry)

  e. g. Trade-Off Theory, Pecking-Order Theory

- **Alternative approach**:
  - Managerial characteristics

    Can individual differences between managers (managerial fixed effects) help to explain CF puzzles?

    Can we measure managerial beliefs / preferences and evaluate their impact on corporate decisions?

Research Agenda

- **Managerial overconfidence**

  = overestimation of future cash flows generated by the manager

  provides a unifying framework for these three puzzles.

- Paper 1 (MT 2005): I/CF sensitivity
  - Overconfident managers perceive their firm to be undervalued; thus reluctant to invest if they have to issue debt and, in particular, equity.
- Paper 2 (MT 2006): Mergers
  - Overconfident managers overestimate returns to mergers; thus too prone to undertake (bad) mergers.

Research Agenda

- This Paper: Capital structure
  - Overconfident managers overestimate the value of risky securities
    - Debt: underestimate bankruptcy probability.
    - Equity: overestimate cash flow
  - Thus reluctant to issue debt and, in particular, equity.

Motivation

- Provides a different angle on (extensive) capital structure debate.
- Confirms importance of CEO overconfidence in a new context and closes important gap (direct effect of undervaluation).
- Has important governance implications
  - Biases don't respond to incentives (stock and options), but may respond to perceived financing constraints.
  - If overconfidence affects preferences over financial instruments, financing policy can be an effective governance tool.

Managerial Overconfidence

- Definition

  Overestimating own abilities / skills / knowledge ➔

  Overestimating outcomes of own actions

- Stylized Fact: “Better-than-Average” Effect
  - Driving skills, IQ, … (Larwood and Whittaker, 1977; Svenson, 1981; Alicke, 1985)
  - Market entry decision (Camerer and Lovallo, 1999)

- Executives appear particularly prone to display overconfidence in experiments.
  - Three main factors (Weinstein, 1980; Alicke et al., 1995)
    - Being in control (incl. illusion of control)
    - High commitment to good outcomes
    - Reference point not concrete

Related Biases

- Over-optimism:

  Outcomes exogenous to own abilities / skills

  E.g. “Will the German (or Italian!) soccer team reach the finals of the World Championship?”

- Over-calibration

  Confidence intervals too narrow

➔ This paper is not about general over-optimism but about endogenous outcomes.

➔ This paper is not about second moments, but about first moments.

Two Patterns

1. Debt conservatism

   e.g. Graham (2000)

2. Conditional on accessing external markets, preference for debt over equity ("pecking order")

   e.g. Shyam-Sunders and Myers (1999)

→ Explanations and empirical evidence debated in capital structure literature.

   e.g. Frank and Goyal (2005) survey

Two Patterns (II)

- Manager-level explanation: some pre-identified managers prefer internal financing over debt, debt over equity
  - →Accommodates variation over time or across firms with identical market/industry/firm characteristics
  - →Predicts patterns only in a subset of firms
- One framework: overconfidence

CEO Overconfidence

Overconfident managers overestimate their ability to generate value ↔

Overestimate future (non-default) cash flows

➔perceive their companies' risky securities to be undervalued by the market

➔reluctant to seek external financing

➔conditional on external finance, prefer debt over equity

Debt Conservativism

Pecking Order of Financing

Theory

- **Result 1 (investment)**: Overconfident CEO overinvests (if sufficient internal funds): $E[\tilde{R}] + p\Delta > I.$
- **Result 2 (mergers)**: OC CEO pursues too many (and some value-destroying) mergers:

  substitute I = external investment (merger)
- **Result 3 (capital structure)**: Overconfident CEOs exhaust cash and riskless debt before issuing risky securities
  - Disagreement over expected value of investment is irrelevant for cash and riskless debt financing
  - Disagreement induces a perceived cost to outside financing since securities are claims on (overvalued) future cash flows

Theory

- Simple set up implies capital structure irrelevance for rational CEOs (Modigliani-Miller)
- Embed in trade-off or pecking order model
  - Pin down the choice of capital structure for the rational CEO.
- Trade-off model:
  - Optimal level of debt balances the cost and benefit of debt, tax deductibility of interest payments and cost of bankruptcy.
  - Overconfident CEO overestimates the future cash flows.
    - ➔ Overstimates tax benefits (=marginal benefit debt).
    - ➔ Underestimates bankruptcy probability (=marginal cost debt).
  - Thus, overconfident CEO issues more debt than his rational peers.

Theory

- Pecking Order Theory:
  - Asymmetric information induces managers to finance first with internal cash, then safe debt, then risky debt, and finally as a last resort, equity.
  - Overconfident manager overestimates future profits
    - overestimates cash earning in the future
    - overestimates future capacity for safe debt
    - perceives equity financing as too expensive (due to both asymmetric information and differences in beliefs).

    ➔ less concerned about the cost of not having enough cash or the inability to issue more safe debt in the future, and more concerned about the high cost of issuing equity.

    ➔ uses more cash and debt to cover given financing deficit.

Theory

- Investment is *not* exogenous
- Overconfident CEOs *may* invest more than other CEOs
  - Overconfident CEOs overestimate cash flows coming from "hand-picked" investment projects
  - Tradeoff between perceived extra returns to investment and costs of external finance

→ Overconfident CEOs may issue more equity than other CEOs, despite preferring debt and internal finance

→ Comparison of equity issuance across CEOs should condition on the need for funds

Data

- Personal Portfolio:
  - Hall and Liebman (1998) / Yermack (1995)
    - Panel data 1980-1994
    - Option / stock holdings of CEOs of large, publicly traded (Forbes 500) companies
- Press:
  - Panel data 1980-1994
  - CEO coverage in *WSJ*, *NYT*, *Business Week*, *FT*, *Economist*
    - Source: *LexisNexis* and *Factiva* searches
- Corporate Accounts:
  - SDC (public security issuance)
  - Compustat, CRSP (cash flow statements / stock prices)

Empirical Experiment (I)

- Sample: CEOs of large companies → highly underdiversified personal portfolios (stocks, options, human capital)
- Calibrate benchmarks for rational option exercise given tradeoff between option value and diversification (Hall and Murphy 2002)
- Consider CEOs who hold in-the-money options "too long"
  - **Longholder**: do not exercise in-the-money options until the last year before expiration (even though 40% in the money)
  - **Pre/Postholder**: Longholder with within-CEO variation
  - **Holder 67**: do not exercise in-the-money options in first year after vesting (even though 67% in the money)

Why Hold Options?

1. Taxes
2. Board pressure
3. Risk neutral (or seeking) preferences
4. Positive information about future stock prices (and/or signaling)
5. Incorrect beliefs about future stock price appreciation (overconfidence)

No Obvious Predictions for Capital Structure

Different Predictions about Timing and/or Performance

CEOs Do Not Profit from Holding Options vs S&P 500

Are Overconfident CEOs Right to Hold Their Options?

For each option that is held until expiration and that is at least 40% in the money at the beginning of its final year, we calculate the return the CEO would have gotten from instead exercising the option one year earlier and investing in the S&P 500. We assume exercise both in the final year and in the hypothetical year occur at the maximum stock price during that year.

Percentile	Return
10th	-0.24
20th	-0.15
30th	-0.10
40th	-0.05
50th	-0.03
60th	0.03
70th	0.10
80th	0.19
90th	0.39
Mean	0.03
Standard Deviation	0.27

Interpretation and Prior Results

- Option “longholders” display investment cash flow sensitivity

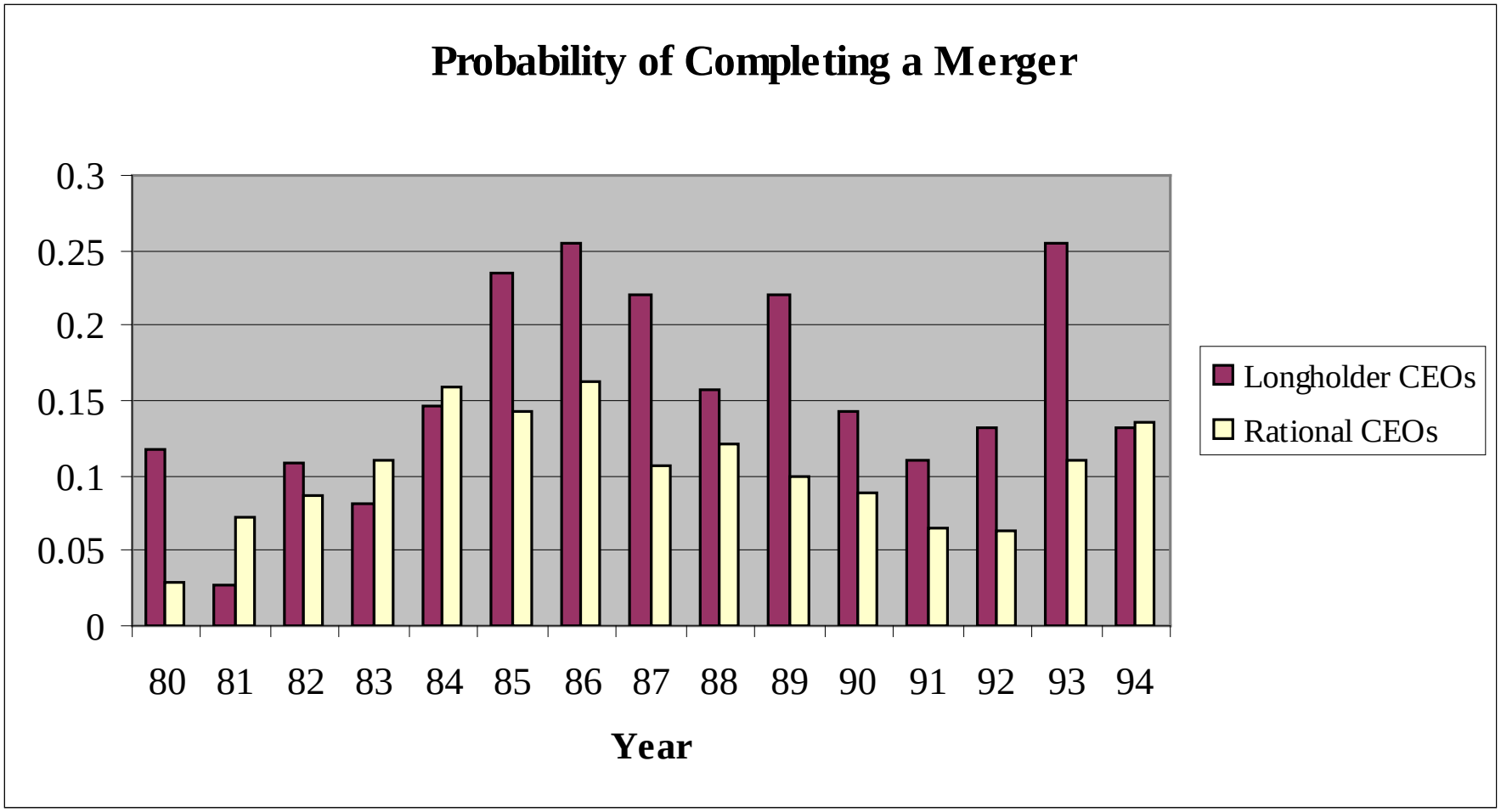
Investment

	(1)	(2)
Cash flow	0.7249	0.656
	(8.33)***	(7.50)***
Q	0.0814	0.0851
	(7.53)***	(7.89)***
Stock ownership (%)	0.1936	0.196
	(2.37)**	(2.41)**
Vested options	-0.0231	0.003
	(0.24)	(0.03)
Size	-0.0465	-0.0494
	(4.81)***	(5.12)***
Corporate governance	0.0012	0.0023
	(0.31)	(0.59)
Longholder		-0.0504
		(2.65)***
(Longholder)*(Cash flow)		0.1778
		(5.51)***
controls*(Cash flow)	yes	yes
Year fixed effects	yes	yes
Firm fixed effects	yes	yes
(Year fixed effects)*(Cash flow)	yes	yes
Observations	3742	3742
Adjusted R-squared	0.54	0.54

Interpretation and Prior Results

- Option “longholders” display investment cash flow sensitivity
- Option “longholders” perform more and worse mergers, in particalur: significantly more negative announcement effect
  - Over the three-day window around announcements, they lose on average 100 basis points, compared to 27 basis points for non-overconfident CEOs.

Mergers


Probability of Completing a Merger
0.3
0.25
0.2
0.15
0.1
0.05
0
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
Year
Longholder CEOs
Rational CEOs

Mergers: Announcement Effect

- Non-Longholders (3-day window): -27 bp
- Longholders (3-day window): -73bp (-101bp)

	(1)	(2)
Stock Ownership		0.0492
		(1.52)
Vested Options		0.1035
		(2.55)**
(Vested Options)^2		-0.0317
		(2.54)**
Relatedness		0.0018
		(0.55)
Corporate Governance		0.0049
		(1.22)
Cash Financing		0.016
		(4.39)***
Longholder	-0.0073	-0.0101
	(1.96)*	(2.56)**
Year Fixed Effects	no	yes
Observations	846	846
R-squared	0.05	0.05

Empirical Experiment (II)

- Consider CEO press coverage in *WSJ*, *NYT*, *Business Week*, *FT*, *Economist*
- Count articles describing the CEO as "confident"/"confidence" or "optimistic"/"optimism"
  vs.
  "reliable"/"cautious"/"practical"/"frugal"/"conservative"/"steady"
- Consider CEOs outsiders perceive as unusually confident
  - **TOTALconfident**: number of past "confident/optimistic" articles > number of past "reliable/etc." articles
    - Control for total number of articles mentioning CEO
    - Unrelated to most rational explanations of late option exercise
    - Positively and significantly correlated with late option exercise!

Overconfidence Interpretation

- Revealed Beliefs: CEOs over-investing in their own company (personal portfolio)
  - Longholder
  - Pre-/Post-Longholder
  - Holder 67
- Outside Perception: CEOs more often characterized as “confident” or “optimistic” in the business press than as “reliable” or in similar terms
  - Totalconfident

See Malmendier and Tate (2005a) and (2005b).

Summary Statistics

	Full Sample				Longholder Sample			
	Number of Firms = 263				Number of Firms = 56			
Variable	Obs.	Mean	Median	SD	Obs.	Mean	Median	SD
Assets ($m)	2385	5476.92	2111.96	13389.44	463	4820.30	2111.78	8763.07
Net Financing Deficit ($m)	2385	42.67	0.75	538.56	463	10.41	-1.05	287.07
Cash Dividends ($m)	2385	109.47	35.58	239.77	463	126.59	40.69	252.09
Net Investment ($m)	2385	502.28	172.70	1311.81	463	498.57	207.37	1070.84
Change in Working Capital ($m)	2385	26.73	16.02	790.77	463	35.54	17.95	347.04
Cash Flow after Interest and Taxes ($m)	2385	595.80	228.56	1276.57	463	650.29	254.62	1243.20
Net Financing Deficit/Assets$_{t-1}$	2385	0.03	0.00	0.16	463	0.02	0.00	0.14
Net Debt Issues/Assets$_{t-1}$	2385	0.01	0.00	0.08	463	0.01	0.00	0.06
Net Equity Issues/Assets$_{t-1}$	2155	0.00	0.00	0.08	413	0.01	0.00	0.09
Profitability	2385	0.18	0.17	0.11	463	0.21	0.19	0.12
Δ Profitability	2385	0.00	0.00	0.06	463	0.00	0.00	0.08
Tangibility	2385	0.44	0.42	0.22	463	0.46	0.43	0.21
Δ Tangibility	2385	-0.05	-0.03	0.11	463	-0.05	-0.03	0.12
Q	2385	1.61	1.30	1.01	463	1.70	1.44	1.02
Δ Q	2385	0.01	0.01	0.50	463	0.03	0.02	0.42
ln(Sales)	2385	7.90	7.82	1.12	463	7.89	7.87	1.18
Δ ln(Sales)	2385	0.08	0.07	0.19	463	0.09	0.08	0.17

Prediction 1

Conditional on accessing external financial markets, overconfident CEOs issue *less equity* than their non-overconfident peers.

Table 2. Public Security Issuance Decisions

	Years with a Security Issue	% of Issue Years with an Equity Issue	% of Issue Years with a Debt Issue	% of Issue Years with a Hybrid Security Issue
Longholder = 0	621	42%	57%	16%
Longholder = 1	141	31%	63%	19%
Pre-Longholder = 1	91	31%	63%	23%
Post-Longholder = 1	50	32%	64%	12%
Difference t (Longholder = 0 - Longholder = 1)		2.03**	0.85	0.85
Holder 67 = 0	95	39%	65%	21%
Holder 67 = 1	182	23%	73%	16%
Difference t		3.12***	1.18	1.04
TOTALconfident = 0	452	48%	47%	18%
TOTALconfident = 1	214	25%	79%	14%
Difference t		5.37***	6.77***	1.43

Table 2. Logits (dependent variable: equity issue indicator)

	Longholder					Pre/Postholder				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Longholder	-0.469	-0.592	-0.534	-0.46	-0.457					
	(1.94)*	(2.34)**	(2.10)**	(1.80)*	(1.66)*					
Pre-Longholder						-0.489	-0.653	-0.586	-0.516	-0.630
						(1.87)*	(2.18)**	(1.78)*	(1.55)	(1.80)*
Post-Longholder						-0.432	-0.49	-0.45	-0.369	-0.193
						(1.00)	(1.25)	(1.35)	(1.12)	(0.63)
Stock (%)		-0.266	-0.996	-1.279	-0.655		-0.255	-0.997	-1.281	-0.637
		(0.16)	(0.59)	(0.72)	(0.34)		(0.16)	(0.59)	(0.72)	(0.33)
Vested Options (%)		6.766	4.669	4.234	7.328		6.715	4.647	4.209	7.367
		(3.43)***	(2.21)**	(2.14)**	(3.05)***		(3.41)***	(2.20)**	(2.13)**	(3.03)***
ln(Sales)			-0.414	-0.437	-0.355			-0.414	-0.437	-0.351
			(3.79)***	(3.70)***	(2.84)***			(3.79)***	(3.70)***	(2.80)***
Q			-0.088	-0.074	0.139			-0.092	-0.078	0.135
			(0.68)	(0.56)	(1.00)			(0.70)	(0.59)	(0.97)
Profitability			-1.872	-1.493	-2.463			-1.844	-1.462	-2.395
			(1.53)	(1.21)	(1.74)*			(1.51)	(1.19)	(1.71)*
Tangibility			0.139	0.088	0.113			0.139	0.089	0.115
			(0.30)	(0.19)	(0.23)			(0.30)	(0.19)	(0.23)
Book Leverage				0.651	1.288				0.651	1.296
				(1.14)	(2.07)**				(1.13)	(2.08)**
Year Fixed Effects					X					X
Observations	762	644	627	617	617	762	644	627	617	617

* significant at 10%; ** significant at 5%; *** significant at 1%

Alternative Framework

- Financing Deficit regressions
  - $FD_t = I_t + DIV_t + \Delta W_t - CF_t$
  - *FD* captures *amount* of financing CEO has to raise through debt or equity (accounting for bank loans, other private sources).
  - Conditioning on "external financing."
- Additional advantages
  - Larger sample; allows inclusion firm FE.
  - Comparability with capital structure literature.

Table 5. FD Framework (Dependent Variable: net debt issues)

	OLS	OLS	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)	(5)	(6)
Net Financing Deficit (FD)	0.729					
	(9.90)***					
Longholder		-0.006	-0.005	-0.008	-0.008	
		(1.43)	(1.37)	1.95*	(2.03)**	
Longholder * FD		0.350	0.348	0.332	0.322	
		(1.78)*	(1.77)*	(1.77)*	(1.69)*	
Pre-Longholder						-0.009
						(2.00)**
Pre-Longholder * FD						0.316
						(1.48)
Post-Longholder						-0.005
						(1.04)
Post-Longholder * FD						0.352
						(2.03)**
Stock (%)			0.015	0.015	0.014	0.014
			(0.87)	(0.90)	(0.85)	(0.87)
Vested Option (%)			-0.025	-0.021	0.000	0.371
			(1.49)	(1.15)	(0.00)	(2.15)**
Stock * FD			0.373	0.431	0.370	0.000
			(2.30)**	(2.63)***	(2.14)**	(0.00)
Vested Option * FD			-0.088	-0.098	-0.135	-0.134
			(3.21)***	(3.59)***	(3.06)***	(3.05)***
Standard FD Controls					X	X
Firm Fixed Effects		X	X	X	X	X
Year Fixed Effects				X	X	X
Firm Fixed Effects * FD		X	X	X	X	X
Observations	2385	2385	2385	2385	2385	2385
R-squared	0.75	0.93	0.93	0.94	0.94	0.94

Table 6. Persistence (Dependent Variable: book leverage in year T)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta_{t=0,T-1}$ Profitability	-0.052	-0.037	-0.100	-0.104				
	(0.81)	(0.59)	(1.40)	(1.44)				
$\Delta_{t=0,T-1}$ Tangibility	0.023	0.003	0.013	0.013				
	(0.40)	(0.06)	(0.20)	(0.20)				
$\Delta_{t=0,T-1}$ ln(Sales)	-0.027	-0.030	-0.005	-0.004				
	(1.95)*	(2.16)**	(0.28)	(0.23)				
$\Delta_{t=0,T-1}$ Q	0.003	0.003	0.030	0.030				
	(0.18)	(0.25)	(1.85)*	(1.87)*				
Book Leverage$_{t=1}$	0.633	0.624	0.572	0.574				
	(8.14)***	(7.93)***	(7.51)***	(7.16)***				
Profitability$_{t=T-1}$					-0.677	-0.657	-0.600	-0.589
					(1.96)*	(1.95)*	(1.80)*	(1.75)*
Tangibility$_{t=T-1}$					-0.128	-0.124	-0.140	-0.132
					(2.79)***	(2.71)***	(3.06)***	(2.90)***
Q$_{t=T-1}$					-0.008	-0.010	0.024	0.023
					(0.29)	(0.38)	(0.92)	(0.89)
ln(Sales)$_{t=T-1}$					0.058	0.050	0.046	0.043
					(5.98)***	(4.69)***	(4.54)***	(4.14)***
TOTALconfident				0.036				-0.016
				(1.18)				(0.57)
TOTALmentions				0.000				0.000
				(2.44)**				(1.59)
External Finance Weighted Average Q			-0.054	-0.054			-0.061	-0.061
			(3.27)***	(3.27)***			(2.86)***	(2.84)***
External Finance Weighted Average TOTALconfident		0.134	0.142	0.091		0.082	0.097	0.095
		(3.18)***	(3.43)***	(1.79)*		(2.01)**	(2.41)**	(2.10)**
Observations	332	332	332	332	332	332	332	332
R-squared	0.24	0.28	0.30	0.31	0.22	0.23	0.25	0.84

* significant at 10%; ** significant at 5%; *** significant at 1%

Prediction 2

Unconditionally, overconfident CEOs are more reluctant to access external capital markets than their non-overconfident peers.

➔ May imply “debt conservativism.”

Measure of Debt Conservatism

- "Kink" proxy of Graham (2000):
  - Debt conservatism = firm can increase its interest payment without lowering the marginal tax rate.
  - "Kink" = ratio of a hypothetical interest level at which the marginal tax rate starts to fall (numerator) to the actual amount of interest (denominator) paid by the firm
- Mechanism:
  - When a firm is committed to low future interest payments, all interest payments are likely to be deduced from future profits

    ➔ tax benefit = (interest payment)* (marginal corporate tax rate)

    ➔ marginal tax benefit flat
  - When firm committed to pay high future interest, then increasingly possible that firm cannot generate enough profits to fully realize the interest tax shield

    ➔ marginal tax benefit is decreasing

Table 7. Tobits (Kink censored above 8)

	(1)	(2)	(3)	(4)	(5)
Longholder	1.034	1.129	0.525	0.723	
	(5.09)***	(5.48)***	(4.05)***	(4.40)***	
Pre-Longholder					0.892
					(4.13)***
Post-Longholder					0.548
					(2.51)**
Stock (%)		3.006	-0.966	-0.836	-0.903
		(2.24)**	(1.13)	(0.98)	(1.06)
Vested Option (%)		-1.992	-1.283	-1.216	-1.166
		(1.78)*	(1.62)	(1.55)	(1.49)
Graham (2000) controls				X	X
I(Bottom 40% of Cash Stock$_{t-1}$ / Mean Industry Investment$_t$) (CS)				-0.237	-0.227
				(1.84)*	(1.77)*
Longholder * CS				-0.500	
				(1.90)*	
Pre-Longholder * CS					-0.299
					(0.86)
Post-Longholder * CS					-0.746
					(2.12)**
Observations	1726	1726	1726	1725	1725

* significant at 10%; ** significant at 5%; *** significant at 1%

Alternative Specification

- Risky rather than riskless debt
  - "Riskless debt = cash"
  - Results should not be driven by extremely-high kink firms.

- Check 1:
  - Sample split by measures of "debt riskiness" (S&P rating)
  - Possible endogeneity, but not much within firm variation
  - No result for "safe-debt firms"
  - No result for "financial-distress firms"
  - Strong result for "medium firms"

- Check 2:
  - Logit with 1 = "Firm debt conservative"
    = "Kink bigger than 1"
  - *Additional benefits of logit specification*
    - Inclusion of firm fixed effects
    - Clustering of standard errors

Table 8. Logits

	Logit (1)	Logit (2)	Logit (3)	Logit (4)	Logit (5)	Logit (6)
Longholder	0.606	0.721	0.552	0.836	1.116	
	(1.59)	(1.79)*	(1.76)*	(2.04)**	(1.59)	
Pre-Longholder						0.803
						(0.99)
Post-Longholder						1.657
						(1.98)**
Stock (%)		2.407	-0.443	-0.452	8.318	8.174
		(0.98)	(0.33)	(0.34)	(1.64)*	(1.65)*
Vested Option (%)		-2.147	0.175	0.287	-4.591	-4.195
		(1.79)*	(0.10)	(0.17)	(0.08)	(0.78)
Graham (2000) controls			X	X	X	X
I(Bottom 40% of Cash Stock$_{t-1}$ / Mean Industry Investment$_t$) (CS)				-0.050	0.340	0.354
				(0.18)	(0.97)	(1.01)
Longholder * CS				-0.659	-1.034	
				(1.26)	(1.58)	
Pre-Longholder * CS						0.280
						(0.44)
Post-Longholder * CS						-2.256
						(1.90)*
Firm Fixed Effects					X	X
Observations	1726	1726	1726	1725	745	745
Number of Firms					75	75

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 9. Distribution of Longholder CEOs' Net Equity Issues by Kink

The sample is all firm years in which Longholder equals 1. Longholder is a binary variable where 1 signifies that the CEO at some point during his tenure held an option package until the last year before expiration, provided that the package was at least 40% in the money entering its last year. Kink (Graham (2000)) is the amount of interest at the point where the marginal benefit function becomes downward sloping, as a proportion of actual interest expense. Net equity issues are sales of common stock minus stock repurchases and are normalized by beginning of the year assets.

	Kink ≤ 1	$1 <$ Kink ≤ 3	$3 <$ Kink ≤ 7	Kink ≥ 8
10th percentile	-0.00834	-0.02923	-0.02668	-0.05162
25th percentile	0.0000	-0.00003	-0.01055	-0.01286
50th percentile	0.00544	0.00180	0.0000	0.0000
75th percentile	0.04148	0.00629	0.00348	0.00794
90th percentile	0.09536	0.01733	0.02928	0.01685
Observations	37	110	111	96
Mean	0.02869	0.00600	0.00497	0.00352
Standard Deviation	0.06086	0.05291	0.08199	0.09174

Summary of Results

	Equity Issuance	Financing Deficit	Persistence in Leverage	Kink
Longholder	Yes	Yes	No*	Yes
TOTAL-confident	Yes	Yes	Yes	No*

* “Failures” arise because TOTALconfident strongly predicts more debt issuance in the cross-section and Longholder does not, an ambiguity of the model!

Conclusions

- Overconfidence induces pecking-order behavior.
- Overconfidence induces debt conservatism.
- “Add-on” to traditional market/industry/firm level determinants of capital structure (trade-off theory, pecking-order theory).

Conclusions (II)

- Corroboration of previous overconfidence results.
  - Overconfident CEOs would like to overinvest, but only if internal funds are available. (“Investment cash-flow sensitivity”)
  - Overconfident CEOs tend to make too many acquisitions, but mostly if internal funds are available (“Urge to merge”)
- Bigger picture (1): Managerial characteristics capture capital structure puzzles, in particular variations within firms.
- Bigger picture (2): Corporate governance via restrictions on financial policies rather than increases in stock/option compensation

Research Topic

- Managerial traits and corporate decisions – beyond overconfidence, beyond depression experience;
- Example: initial labor market conditions; education; first professional experiences etc.