How Risk Tolerance Changes with Age & Life Events:

Empirical Evidence using U.S. Panel Data

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Who Will Bear Financial Risks?

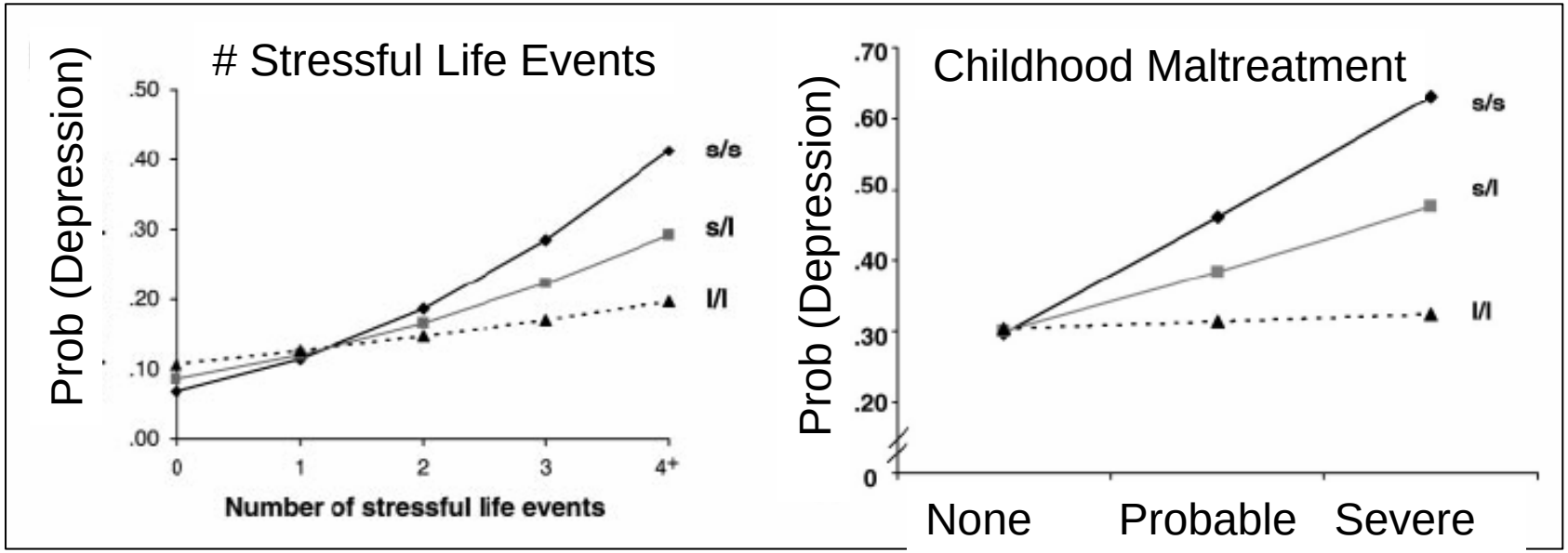
- Demographic
  - younger, male, unmarried, infrequent church attendance
- Economic
  - higher wealth, higher income, more educated, parents more educated
- Physical
  - taller
- All evidence is from cross sectional studies
  - Surveys, experiments, field data
  - Dohmen et al. (IZA WP‘05); Donkers et al (JRU ‘01); Hartog et al. (Kyklos ‘02); Eckel & Grossman (‘02); Barsky et al. (‘97); Hallahan (‘04); Rosen et al. (‘03); Harrison et al. (‘05);Schubert et al. (99)

Limits of Cross Sectional Data

- Many confounds
  - Is age effect really a cohort effect?
    - Great depression vs. credit-card generation
  - Will changes in income impact risk tolerance
    - Really need to observe how an individual responds to changes in income, not cross sectional differences
- Many topics off limits
  - Do large shocks alter risk preferences?
  - Are there feedbacks from Macro to preferences?

Impacts of Life Events/Shocks

- Ample evidence from mental health literature
  - Caspi et al. (2003 *Science*) and replications
  - Likelihood of depression function of # SLE's
    - For certain genotypes



Panel Data on Risk Tolerance

- Health & Retirement Study (HRS)
  - 12,000+ respondents born 1931-41 (50-60 years)
  - Interviewed in even numbered years since 1992
  - 3,625 answer risk questions in
    - 1992 (50 – 60 years of age)
    - 2002 (60 – 70 years of age)
- Previous work using HRS risk questions
  - Barsky et al. (’97 QJE) verify that responses to questions correlate with behavior (asset allocation, other risky behavior)
  - Sahm (2006) looks at changes in risk over time

Panel Data on Risk Tolerance

- National Longitudinal Study – Youth (NLS)
  - U.S. residents aged 14-22 in 1979 (first interview)
  - 7,363 answered risk questions in
    - 1993 (28 – 36 years of age)
    - 2002 (37 – 45 years of age)
- No previous research using the NLS risk questions (that we know)
- Many HRS covariates not present in NLS
  - Impractical to pool the 2 data sets

Risk Questions

- Hypothetical
  - "Suppose that you are the only income earner in the family. Your doctor recommends that you move because of allergies, and you have to choose between two possible jobs. The 1st would guarantee your current total family income for life. The second is possibly better paying, but the income is also less certain. There is a 50-50 chance the second job would double your total lifetime income and a 50-50 chance that it would cut it by a {half, third, fifth}. ….. Which job would you take?"
  - All are asked 'a half'
    - If they reject that job, work up to 'a third' and 'a fifth' if needed
  - Both NLS and HRS use nearly identical question

Risk Question

- Strengths
  - Deals with lifetime income
  - Barsky et al. (1997) shows it predicts asset allocation decisions and other risky behavior
- Weaknesses
  - It is hypothetical
  - 1992 HRS has slightly different phrasing that can lead to a status quo bias
  - Only provides an interval for risk tolerance

Data – Income Gamble Responses

Income Gamble: Offered chance to double current income with a chance of losing fraction of current income	NLS (n=3635)		HRS (n=7363)	
	1993 %	2002 Δ in %	1992 %	2002 Δ in %
I - Reject both 1/3 & 1/5 (*least* risk tolerant)	46.5	+ 8.6	64.6	- 2.0
II - Reject 1/3, accept 1/5	11.6	- 1.1	11.6	+ 4.0
III - Accept 1/3, reject ½	16.8	- 1.2	10.9	- 1.4
IV - Accept 1/2 (*most* risk tolerant)	25.2	- 6.4	12.9	- 0.6

- More changes in risk tolerance for younger group
- Older group appears to moderate risk tolerance with age
- Younger group grows less risk tolerant with age
- Steady progression of least risk tolerant group:

  28 – 36 ~ 46% (NLS) → 38 – 46 ~ 55% (NLS) → 50 - 70 ~ 65% (HRS)

Cardinal Risk Tolerance Measure

	Relative Risk Tolerance (θ)		$\log(\theta)$	
Response	Lower	Upper	Lower	Upper
I	0	0.27	$-\infty$	-1.31
II	0.27	0.5	-1.31	-0.69
III	0.5	1.0	-0.69	0
IV	1	∞	0	∞

- We translate response to questions to an interval of a cardinal risk tolerance measure
  - Assuming $U(W) = 1/(1- \theta)\ W^{1/(1- \theta)}$
  - Used by Barsky et al. (1997) and Sahm (2006)
- We could also keep it ordinal for purposes of modeling

Change in Risk Tolerance

Answer to Income question		Δ in log (θ)	
1st Response	2nd Response	lower	upper
I	I	- ∞	+ ∞
I	II	0	+ ∞
:	:	:	:
IV	III	- ∞	0
IV	IV	- ∞	+ ∞

- We are interested in the change in risk tolerance
  - Derive intervals in which the log change in risk tolerance must fall for any combination of response intervals for 1st and 2nd interview (16 possible cases)

Econometric Approach

- Dependent variable
  - Change in log(θ)
  - Requires interval regression
    - Prob(lower bound < log(θ) < upper bound)
      - Only observe the interval in which the continuous latent variable lies
    - Implemented via MLE
- Independent variables
  - Time invariant characteristics fall out
    - Could be recovered via a random effects approach (Sahm 2006)
  - Time invariant explanatory variables include changes in
    - Income, marital/household status, employment status, health status,

HRS – Δ log(risk tolerance)

Variables	Estimates	p-value
Change in income	- 0.027	0.60
Married (omit never married/single)	- 1.127	0.048**
Separated (omit never married/single)	- 0.446	0.25
Widowed (omit never married/single)	- 1.110	0.001***
Unemployed (omit continuous employment)	0.854	0.005***
Retired (omit continuous employment)	0.334	0.08*
Re-employed (omit continuous employment)	0.168	0.69
Increase in health conditions/problems	- 0.186	0.02**
Acquired health insurance	- 0.209	0.33
Death of child	0.031	0.91
Death of sibling	- 0.025	0.33

*A negative sign → less risk tolerant

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NLS – regression results

Variables	Estimates	p-value
Change in income	- 0.539	<0.001***
Married (omit never married/single)	- 0.184	0.36
Separated (omit never married/single)	- 0.010	0.96
Widowed (omit never married/single)	- 0.495	0.57
# weeks Employed (past 2 years)	- 0.006	<0.001***
# weeks Unemployed (past 2 years)	0.008	0.07*
Onset of any health limitation	- 0.205	0.42
Acquired health insurance	- 0.350	0.11
Increase in # children	- 0.149	0.08*
Moved into own dwelling unit	- 0.507	0.08*

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Key Findings

- HRS
  - No discernable aging effect
  - Widowhood reduces risk tolerance
  - Unemployment increases risk tolerance
    - Selection effect?
  - No income effect
  - Risk tolerance drops with worsening health
- NLS
  - Strong aging effect
  - Risk tolerance drops with increase in income
  - Employment decreases risk tolerance
  - Establishment of home and increase in family size reduces risk tolerance
  - No marital or health effects

Comparison to Sahm (2006)

- Sahm
  - Random effects approach
    - Appealing b/c allows modeling of
      - Mean effect
      - Interview specific deviations
      - Incorporates macro indicators like consumer confidence
      - We will likely pursue this approach as well
  - Sahm's key results
    - No income effect
    - Limitation: only sample of people 50+ years
      - Much less malleability at this age
      - Gillespie et al. (2005) find stressful life event less likely to influence probability of depression among older cohorts

Work to be done

- Econometric improvements
  - Rule out reverse causality and selection issues
- Explaining Why
  - Aging - Dopamine Hypothesis?
    - A key mechanism for learning about rewards
    - # receptors in brain decline with age
      - Dopamine activity declines
      - May alter explore/exploit ratio
  - Unemployment
    - Selection of high risk takers into fields w/ layoffs
    - Leads to anxiety which heightens reward response