The Longlasting Effects of Crises and Other Past Experiences on Expectations and Economic Decisions

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How do Crisis Experiences Affect Beliefs and Decision-Making?

Example: Effect of the COVID-19 Pandemic

1. **Immediate Impact** of being "at home" on behavior/consumption: less or different interaction at work, in stores, with physician etc; online shopping, using yoga/HIIT apps, telemedicine; more trading (Robinhood trending on twitter; GameStop)

STOCKS

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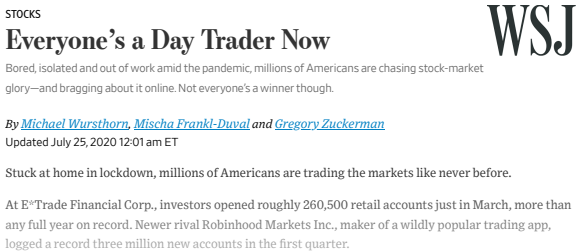

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3. **Long-Run Impact** of pandemic *beyond* changes (in jobs, health measures etc.) that "are here to stay."
   - How does the experience alter beliefs and behavior in the long-run?
   - How do the long-run effect depend on personal exposure?

A Little Exercise in Magical Thinking

- Suppose we lived in a country where the entire population was vaccinated & boosted, and the vaccine was effective against all variants of the virus.
- Everybody has returned to their pre-pandemic education or job situation; earnings and earnings prospects are as if the pandemic did not happen; impact on accumulated wealth is minimal; we are holding all seminars and conferences in person (!)
- Basically, we are back to the world of pre-COVID-19.
- **Question:** Under these magical assumptions, would we be back to economic decisions and financial risk-taking from pre-COVID-19?
  - That's what an exclusive focus on SR + MR impact implies.
  - That's not what economists are saying, but arguments build on "economic conditions have changed;" we will not be back to pre-COVID-19 conditions.
  - What about "we have changed" and will behave differently even if the world returned back to its pre-COVID version?

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Some Clues from Prior Epidemics

- **Epidemics** such as Bubonic Plagues, Tuberculosis, the 1918 Influenza, or HIV/AIDS generally recognized as essential for historical outcomes during those periods
  - Impact on par with the role of war, religion, economics, and high culture
- For **economic outcomes**
  - Change in demographics (e.g., Black Death transformed the demography of early modern Europe: significant plunge in population growth between the 14th and 18th centuries)
  - Change in GDP
  - Change in trade patterns, trade routes
  - Change in financial capital available
  - ...
  - Change in world views and beliefs

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The Impact of the Black Death on 'Beliefs'

- Medical beliefs
  - "In the air" (smoking for health, masks)
  - More attached to certain surfaces than others (leather and waxed fabrics as protection)
- Religious beliefs and World Views
  - Substantially influence on religious beliefs, a new piety, cults of plague saints, and passion plays (Oberammergau).
  - Begin of the modern theodicy discussion
    - ★ "The result was not so much atheism as a mute despair that was most often barely articulated—a psychological shock that, with historical hindsight and anachronism, one might call post-traumatic stress." [Frank Snowden (Epidemics and Society, 2019)]
  - Emphasis on *vanitas* idea (earthly life is fleeting) ⇒ less investment, including less investment in human capital (education)

Experience Effects

Traditional Models of Economic Decision-Making

- Effect of "personally experienced pandemic or crisis" no different from information about outcomes *ceteris paribus*.
- Effect of "living through a depression" on financial investment no different than effect of reading about it; of "having experienced unemployment" on consumption no different than knowing your risk of future unemployment; of living through a pandemic no different from knowing about likelihood and implications (controlling for wealth, income, age, etc.).

Models and Empirical Evidence of Experience Effects

- Personal experience has lasting impact on beliefs and behavior (scarring effects).
- "Re-wiring" (neuroplasticity, synaptic tagging)

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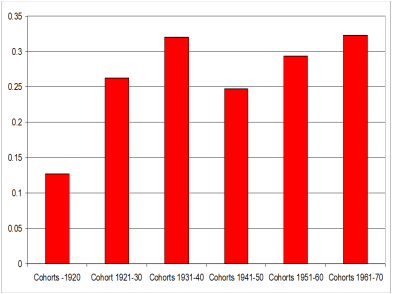
A Famous Example (in the US): Depression Babies

(Malmendier and Nagel, QJE 2011)

"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."

Illustration:

stock-market participation rates at age 36-45



- Participation of generation that experienced the 1930s Great Depression as teenagers/adults (13%) significantly lower than that of all other cohorts (26-32%).
- 1931-1940 cohort experienced the post-war boom years during their young adult life, has a participation rate at age 36-45 that is more than twice as high.
- In 1941-50 cohort, the rate dips again, consistent with the fact that this cohort reached age 36-45 just after the depression years of the 1970s.

Depression Babies

(Malmendier and Nagel, QJE 2011)

Approach: Probit model $\Pr(y_{i,t} = 1 | x_{i,t}, A_{i,t}(\lambda)) = \Phi(\alpha + \beta A(\lambda) + \gamma' x_{i,t})$ in SCF data,
with $A_{i,t}(\lambda)$ = weighted sum of past experiences (weights governed by λ)
using ML to simultaneously estimate λ and coefficient β.

1. Relate $A_{i,t}(\lambda)$ = investors' "lifetime stock-market experiences" to $y_{i,t}$ = stock investment.
2. Relate $A_{i,t}(\lambda)$ = investors' "lifetime bond-market experiences" to $y_{i,t}$ = bond investment.

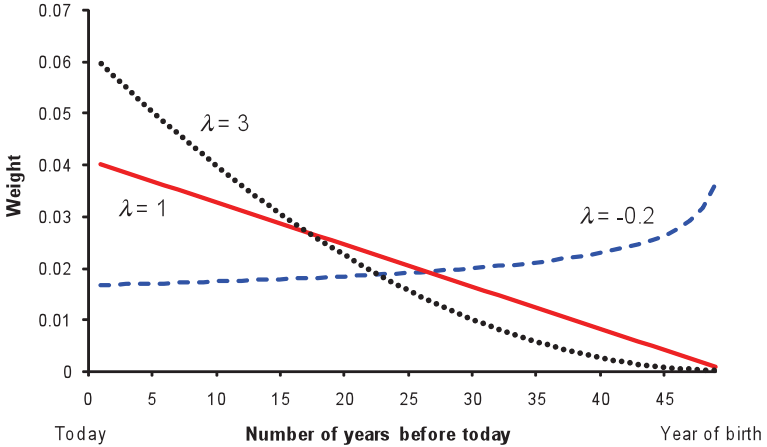
Results

- Stock-market participation (Stock holdings > \$0): IDR +14 pp
- Bond-market participation (Bond holdings > \$0): IDR +15 pp
- No cross-fertilization!

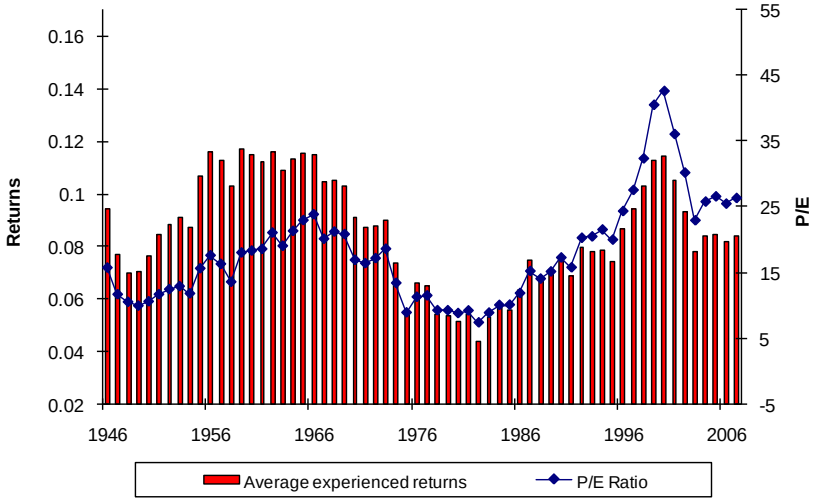
Weighting Function

$$A_{i,t}(\lambda) = \sum_{k=1}^{\text{age}_{i,t}-1} w_{i,t}(k,\lambda) R_{t-k} \text{ and } w_{i,t}(k,\lambda) = \frac{(\text{age}_{i,t}-k)^{\lambda}}{\sum_{k=1}^{\text{age}_{i,t}-1} (\text{age}_{i,t}-k)^{\lambda}}$$

Illustration for 50-year old individual

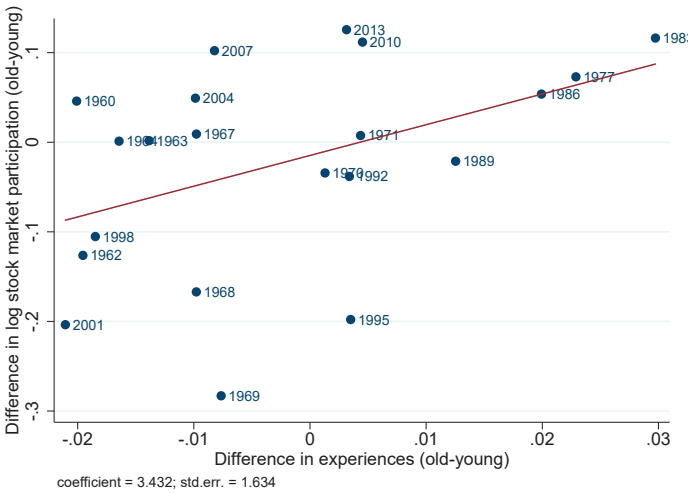


Aggregate Perspective: Market Valuation



Aggregate Perspective (2): Market Composition

$\Longrightarrow$ Speaks to confound "life-cycle stage"/age versus past experiences

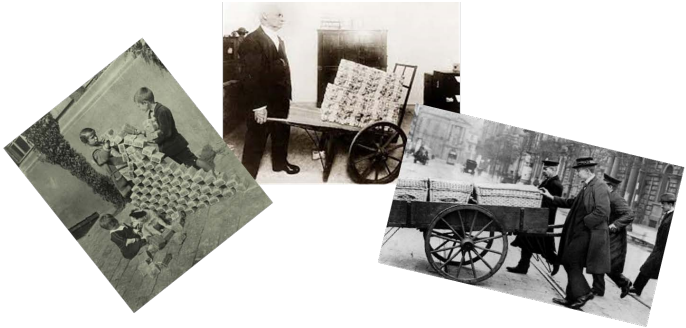


Experience Effects – Key Features

1. Experiences over one's lifetime so far have long-lasting effects on beliefs and choices.
   - Different cohorts are affected differently.
2. Experiences are domain-specific.
   - No cross-fertilization between different realms of economic decisions.
   - Same pattern across domains (stocks, bonds, inflation, interest rate expectations, unemployment experiences etc.)
3. Extent of exposure matters.
   - Different locations are affected differently.
   - **Implication**: Different genders/races/... are affected differently in the long-run, even exposure has passed.
   - **Implication**: Interaction with inequality.
4. Robustness (imperviousness) to **learned knowledge**: Experiences affect experts.

Another Example: Inflation Experiences $\Longrightarrow$ Inflation Beliefs

German motivation ...



... and US motivation

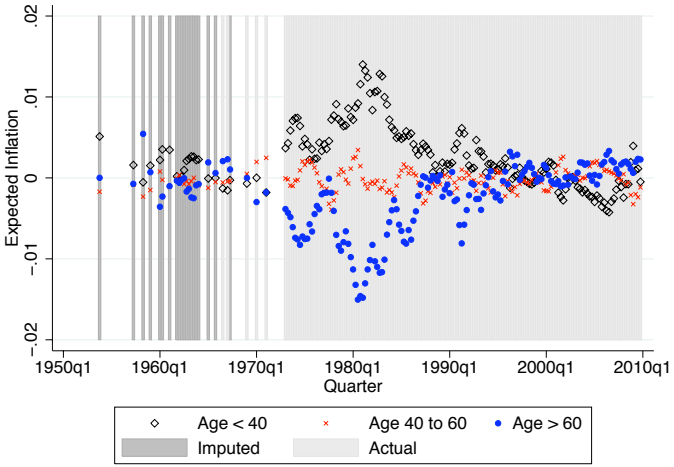
Paul Volcker (1979): "An entire generation of young adults has grown up since the mid-1960s knowing only inflation, indeed an inflation that has seemed to accelerate inexorably. In the circumstances, it is hardly surprising that many citizens have begun to wonder whether it is realistic to anticipate a return to general price stability."

Findings: Inflation Experiences $\Longrightarrow$ Inflation Beliefs

Malmendier and Nagel (2016), using MSC data since 1953

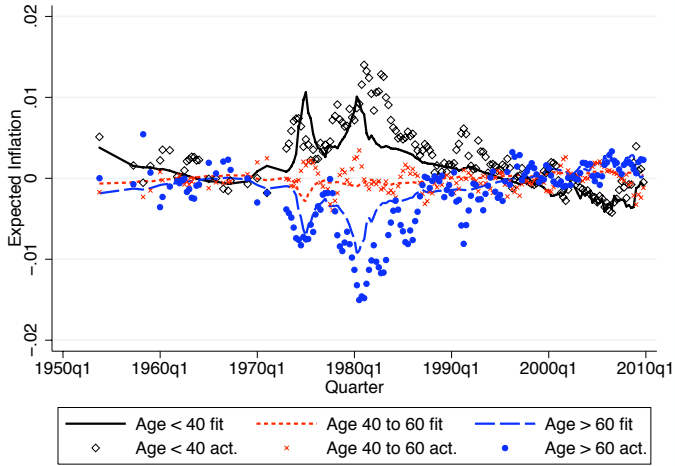
1. When forming inflation expectations, individuals put a higher weight on realizations experienced over their life-times than on other available historical data.
   - Similar to adaptive learning: people learn following simple "rules of thumb" (e.g., Bray 1982; Marcet and Sargent 1989)
   - Different from adaptive learning: people learn (more) from data realized during their lifetimes. (adaptive learning: all historical data)
2. Implicit weighting of past experiences very similar to weighting pattern in stock market (and other data) data!
   - Roughly linearly declining weights.
3. Significant impact on individual financial decisions, namely, long-term nominal-rate borrowing and lending.

Disagreement about future inflation (MSC)



Four-quarter moving averages of one-year inflation expectations shown as deviations from the cross-sectional mean.

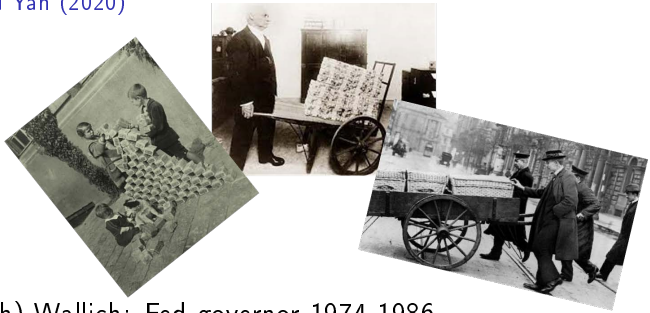
Fitted expectations



Fitted and actual relative to full-sample c.s. mean (4-quarter MA)

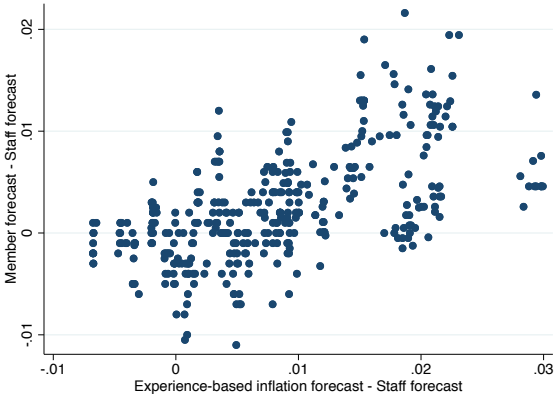
Inflation Experiences of Experts

Malmendier, Nagel, and Yan (2020)



- Henry (Heinrich) Wallich: Fed governor 1974-1986
  - Born in Germany in 1914 into a family of bankers.
  - Lived through Germany's hyperinflation in 1923.
  - Emigrated to the US in the 1930s.
- Wallich dissented 27 times (!) during his tenure on the Fed Board, the highest number of dissents in Federal Reserve history, **decades later**.

Beyond Wallich: FOMC Members' Inflation Experiences and Forecasts



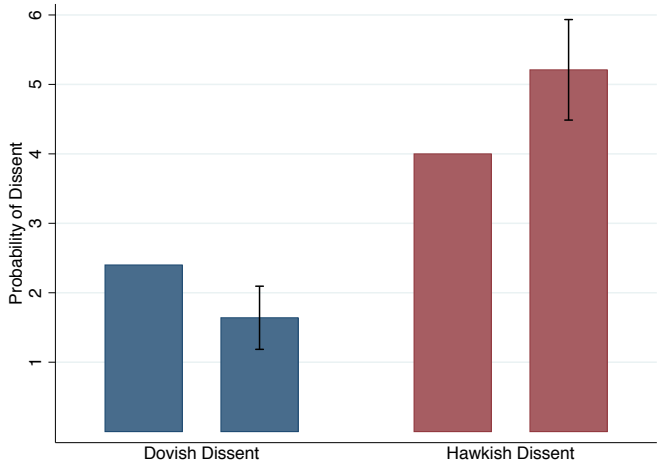
Member forecast: from semi-annual Monetary Policy Report to Congress, 1992 - 2004.

Staff forecast: Greenbook forecast.

Experience-based forecast: AR(1) model forecast estimated based on weighted life-time inflation data for each FOMC member.

Inflation experiences and FOMC voting behavior

Effect on dissent probabilities of +0.1pp rise in experience-based inflation forecast



Information vs. Rewiring

- Traditional economic explanation for effects of past exposure on beliefs: information
- Results (taken together) challenge information channel, esp. applicability to experts (FOMC member, fund managers, bankers, physicians)
- Results challenge some behavioral channels, e. g., limited attention, cognitive challenges.

Information $\longrightarrow$ Software $\longrightarrow$ Hardware

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Neuroplasticity

(Cf. Laudenbach, Niessen-Ruenzi, Malmendier AEA P&P 2019; NBER WP 2020)

- Every time we have a new experience, our brain forms a connection between two neurons (synapse).
  - Synapses tell our body how to react to the world around us. The govern the way we experience life.
- The brain can reorganize pathways, create new connections, and even create new neurons (neuroplasticity) in response to learning, experience, and memory foundation
- Generally, young brains tend to be more sensitive and responsive to experiences than older brains. But the brain never stops changing.

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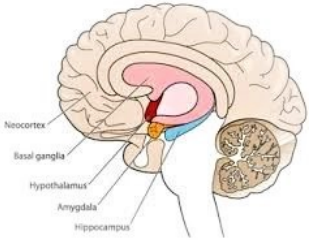
Synaptic Tagging



- How and how often we make an experience matters.
  - Repeated stimulation of hippocampal neurons can induce a prolonged increase in synaptic strength (long-term potentiation (LTP), Frey and Morris (*Nature* 1997, *Trends in Neuroscience* 1998))
  - Prior or subsequent "learned knowledge" has very limited power to undo the effects.
- Cf. literature on trauma: Synaptic changes caused by traumatic stress (Mahan and Ressler *Trends in Neuroscience* 1998, Zhang et al, *Front Psychol* 2020).

Which Experiences?

- Trauma with a big T: German Hyperinflation, Great Depression, Pandemics
- trauma with a small t: Daily Exposure, daily worry about food, prices, unemployment
- Other repeated (non-traumatic) exposure, including positive experiences

Example: Gendered Experiences

D'Acunto, Malmendier, Weber (2020): "Gender Roles and the Gender Expectations Gap"

Within-Household Inflation Expectations

- Women have (more) positively biased inflation expectations, even within households.
- Unconditional difference driven by differences in grocery shopping.

Take Aways

- Longlasting effects of personal experiences on beliefs and risk-taking ("econ-PTSD")
  - From $y_{t,i} = f(x_{i,t})$
    to $y_{i,t} = f(x_{i,t}, A(x_{i,t-1}, x_{i,t-2}, x_{i,t-3}, \ldots x_{i,0}))$
- Reveals confounds in attributing financial decisions (such as stock versus bond investment) to "life-cycle stage" (e. g., in workforce versus retiree) and "past experiences"
- Evidence from macro, labor, finance, political economy
  $\Longrightarrow$ broadly applicable to learning and choice behavior
  - Feasibility of accounting for experience effects: "Big Data" within-person
  - Welfare and policy implications: information campaigns versus experiences, spill-over to the role of media and communication: limited effect unless "experiential" (cf. reggae songs of Central Bank of Jamaica, Netflix movies).