Experience Effects

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

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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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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?

A Post-COVID Exercise in Magical Thinking

- Suppose 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.

- Basically, we are back to the world of pre-COVID-19.

- **Question:** Under these 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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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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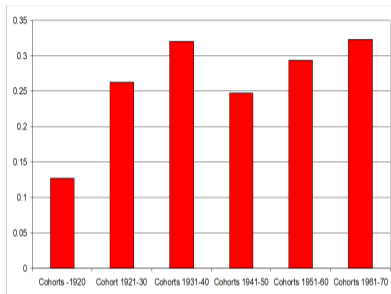- "Re-wiring" (neuroplasticity, synaptic tagging)

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

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

- IDR effect of moving from a bad to a good lifetime experience (10th to 90th percentile) on probability of being in lowest risk-tolerance category (baseline 36.3%): -10.1 pp
- Stock-market participation (Stock holdings > \$0): IDR +14 pp
- Bond-market participation (Bond holdings > \$0): IDR +15 pp
- No cross-fertilization!

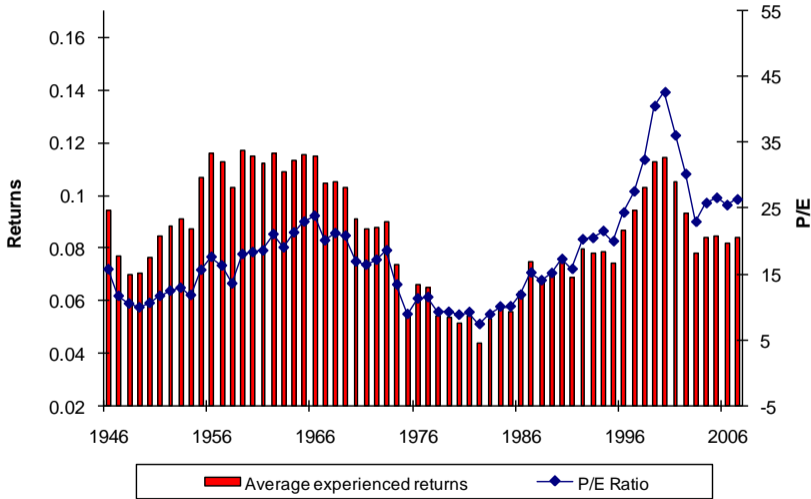# Weighting Function

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

Illustration for 50-year old individual
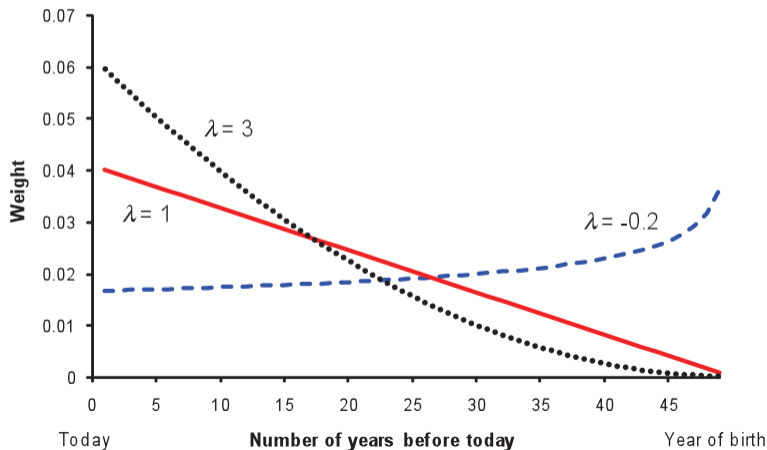
Aggregate Perspective (2): International Capital Flows

(Malmendier, Pouzo, Vanasco, JIE 2020)

Experience effects help explain classic international macro puzzles regarding capital flows and portfolio investment, namely the tendency of investors to

1. hold an over-proportional fraction of their equity wealth in domestic stocks (home bias)
2. invest in domestic equity markets in periods of domestic crises (retrenchment),
3. withdraw capital from foreign equity markets in foreign & global crises (fickleness).

Basic intuition: More exposure to domestic risky-asset returns $\implies$ more precise prior. All tested and confirmed in data from the IMF, World Bank, World Federation of Exchanges.

Applications of Experience Effects

Evidence of personal experiences affecting beliefs and choices from

- IPO investment
- stock-market investment (Depression Babies, East Germany)
- bond-market investment
- tenure decisions (buy versus rent)
- mortgage choices (ARM versus FRM)
- consumption spending (and unemployment experiences)
- international capital flows (home bias, retrenchment, fickleness)

(Kaustia and Knuepfer 2008; Malmendier and Nagel 2011, 2016; Malmendier, Pouzo, Vanacsco 2019a,b; Botsch and Malmendier 2021; Mamendier and Steiny 2020; Malmendier and Shen 2020; Laudenbach et al. 2021)

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.

More on "4. Experiences affect experts" $\implies$ Inflation Experiences

German motivation ...
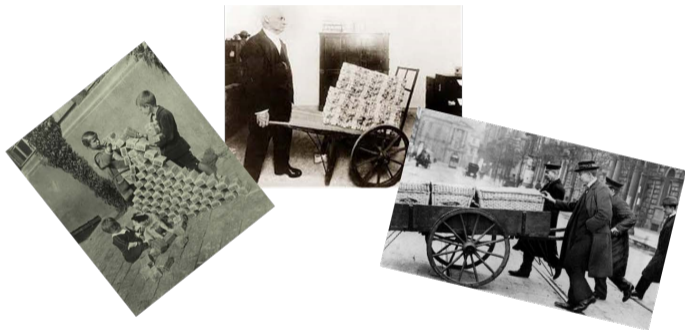
... and US motivation

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."

Inflation Experiences and 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.
   - <u>Similar to adaptive learning</u>: people learn following simple "rules of thumb" (e.g., Bray 1982; Marcet and Sargent 1989)
   - <u>Different from adaptive learning</u>: 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, though AR(1) or seasonal-AR(4) process.

3. Significant impact on individual financial decisions, namely, long-term nominal-rate borrowing and lending.

Disagreement about future inflation (MSC)
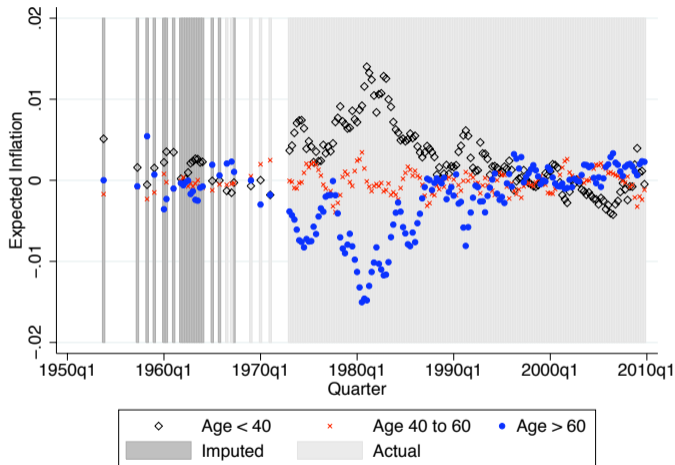
Four-quarter moving averages of one-year inflation expectations shown as deviations from the cross-sectional mean.
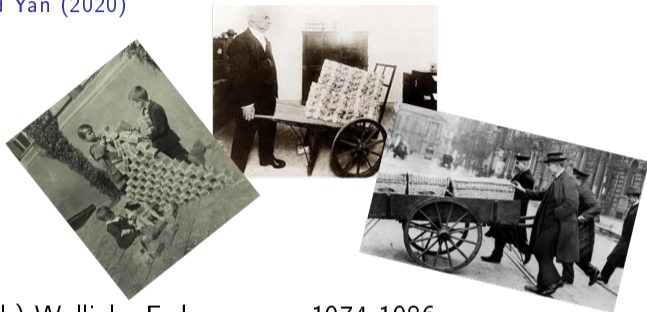
Fitted expectations
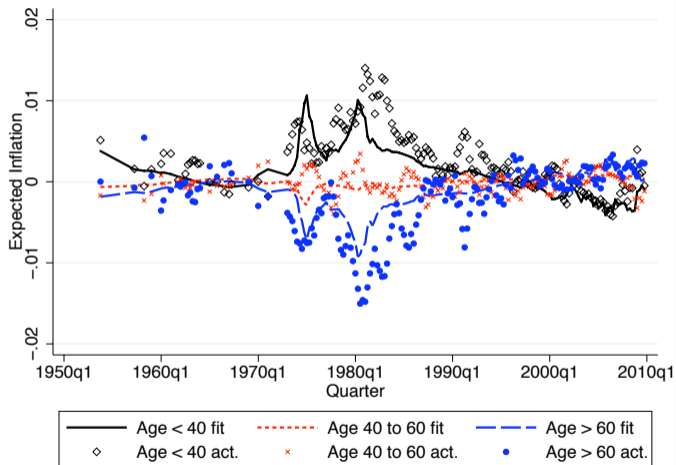
Fitted and actual relative to full-sample c.s. mean (4-quarter MA)

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**.

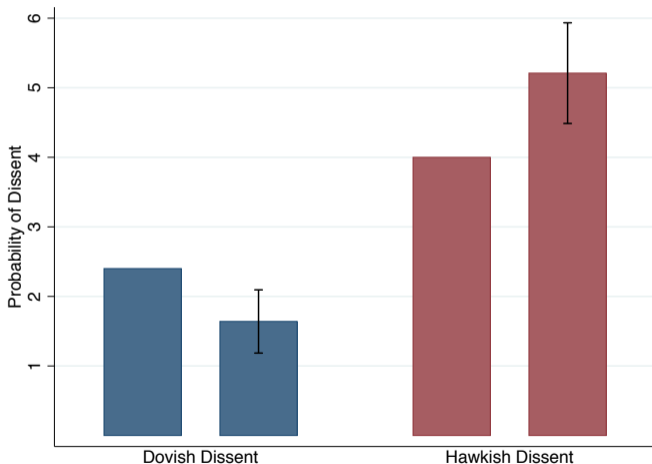# Beyond Wallich: FOMC Members' Inflation Experiences and Forecasts
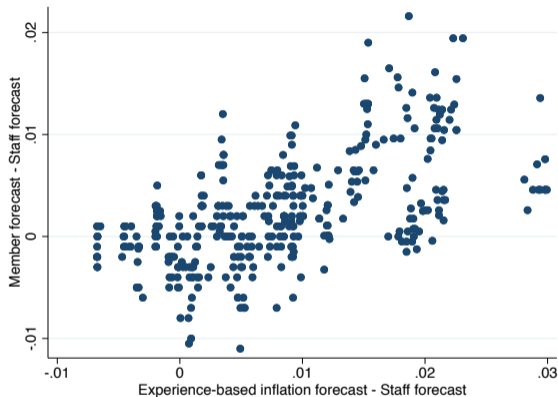
Member forecast: from semi-annual Monetary Policy Report to Congress, 1992 - 2004.

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 (Firmware)

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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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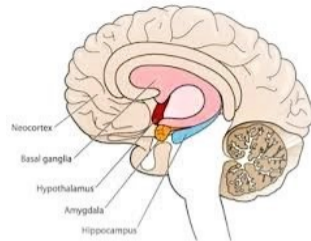
Synaptic Tagging

- 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)) $\implies$ Duration and repetition
  - Emotional events attain privileged status in memory, Dolan *Science* (2002), LaBar and Cabeza *Nature* (2006). (Emotional Tagging)
  - 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 (PNAS, 2021): "Gender Roles Produce Divergent Economic Expectations"

Within-Household
Inflation Expectations

Short-term Inflation Expectations
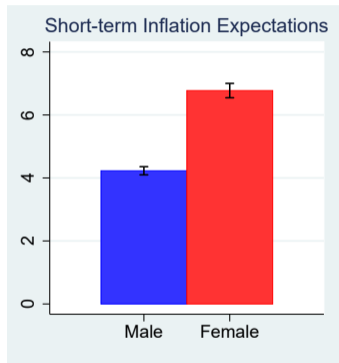
- Women have (more) positively biased inflation expectations, even within households.

Why Are Women (More) Biased? They Do the Groceries!

Groceries highly volatile, and consumers known to anchor on price increases.

Gender Difference in Inflation Expectations

- Large difference in inflation expectations by gender *within* household
- Unconditional difference driven by differences in grocery shopping

Traditional Models of Economic Decision-Making

- Payoff maximizer
- Bayesian beliefs
- Perfect cognition

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» **Homo oeconomicus**

Behavioral Models: Psychological Realism

- ~~Payoff maximizer~~
- ~~Bayesian beliefs~~
- ~~Perfect cognition~~

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» **Homo ... sapiens?**

    ... humanus? ... humanior?

Experience Effects: Finding a Place for Underlying Bio-/Neuroscience

Psychologically Realistic Dynamic Belief Formation

» **Homo experiens**

- *experiri, experiens*
- *ire $\implies$ per $\implies$ ex*

Fear from the Great Depression by Brianna Cole

www.funnytimes.com

- *experiri, experior, expertus sum*

Take Aways

Existing Research on Experience effects

- Longlasting effects of personal experiences on beliefs and risk-taking ("econ-PTSD")
  - From $y_{t,i} = f(x_{i,t})$
    to $y_{i,t} = f(x_{i,t}, A(x_{i,t-1}, x_{i,t-2}, x_{i,t-3}, \ldots x_{i,0}))$
- Daily exposure and its lifetime aggregation have a significant long-term impact in all areas of economic decision making.
  - "Trauma with a big T": Macro shocks, even if pre-crisis conditions are re-established.
  - "trauma with a small t": Being placed into a certain daily environment
- Even among well-informed experts (central bankers, finance experts, doctors)
  - Not a question of intelligence; a question of re-wiring. (Link to synaptic tagging)
- Properties of experience effects: (1) longlasting effects, (2) recency bias, (3) domain specificity, (4) dominates abstract knowledge (neuro-science foundations, synaptic tagging)
- Evidence from macro, labor, finance, political economy

Take Aways

Opportunities for Future Research

- Applicability to: hh finance, gender, racism, children (ACEs), education

- Feasibility of accounting for experience effects: "Big Data" within-person

- Welfare and policy implications

- **Areas** for economic research:
  - ▶ Work cited today from general interest economics journals (QJE,JPE,PNAS), finance (JFE), international economics (JIE), monetary economics (JME).
  - ▶ Wider applicability within finance (esp. hh finance) and beyond (gender, race)

- **Policy Implications:** Role of exposure, role models, personal experiences etc. above and beyond information, regulation, opportunity.

THANK YOU!

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All speculations are my own ☺