Social Transmission Bias in Economics and Finance

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Slides and transcript will be available at:
https://ssrn.com/abstract=3513201

Presidential Address
American Finance Association
January 4, 2020
Social economics and finance

• Missing chapter in our understanding of finance:
  • The **social processes** that shape economic thinking, behavior

• **Social economics and finance:**
  • The study of how social interaction affects economic outcomes
  • Recognizes that people observe each other, “talk” to each other

• A key intellectual building block:

  Social transmission bias
Some recent intellectual revolutions

- Information economics
  - Recognized that some people know things that others do not
- Behavioral economics, finance
  - Recognized that people make systematic mistakes
Do we already know?

• Scholars “knew” these facts before each revolution
  • But considered informally, sporadically
  • Not systematically, explicitly, routinely incorporated in models, tests

• Same now for social economics and finance
Behavioral finance: Path from assumptions to conclusions often very direct

• Beliefs
  • Investors trade too aggressively?
    ➔ Overconfident
  • Expectations rise after price run-ups?
    ➔ Overextrapolate
Preferences

• Investors:
  • Buy lottery stocks?
  • Sell winners more than losers?
  • Save too little?

➤ Taste for: skewness, realizing gains not losses, immediate consumption

• Yes, but...
Attraction to a behavior ≠ A preference for it

• Moths attracted to flame

• Moths not flame-loving
• Navigations systems designed by natural selection to work with distant light sources
  • Nearby light sources fool navigation systems
Social emergence

- Purely individual-level navigation errors (moths)
  - One kind of indirect effect
- Another: social emergence
  - Aggregate outcomes not just sum of individual propensities
Example of a socially emergent effect

• Death spirals

• Rotative instinct?
  • A heuristic or bias for circular motion?
    • Vs. instincts for random search, following others
  • Akin to information cascades
    • Banerjee (1992), Bikhchandani, Hirshleifer & Welch (1992)

• Aggregate outcome looks nothing like individual propensities
Implication of emergence

• Unwarranted:
  • Observed behavior ➔ Direct psychological bias “for” that behavior
• In Finance field, emergent social effects usually neglected
  • Transmission bias missing from standard toolkit
Goal of social economics and finance

- Social economics & finance
  - **Build on standard ingredients**
    - Preferences, optimization, psychological bias, equilibrium
      - As in behavioral economics:
        - Well-motivated assumptions
          - Psychological evidence
          - Evolutionary plausibility
  - Capture systematically, tractably:
    - Socially emergent, as well as direct, effects
Plan for rest of this talk

• Some milestones of the social economics and finance revolution
• What is social transmission bias?
• Five fables of social transmission bias, economics and finance
  • Does transmission bias offer novel messages, wide-ranging applications?
• Emergent themes and closing words
Some milestones of the social economics & finance revolution
Some milestones of the social economics & finance revolution

• Models of
  • Biased social influence in networks
  • Surveys:
    • Jackson (2008), Golub & Sadler (2016)
  • Cultural transmission of ethnic, religious, & cooperative traits
  • Payoff interactions/games

• Empirical literatures on:
  • Narratives, folk models & finance
  • Culture, ideology, & economic outcomes
  • Contagion of economic/financial behaviors
    • Individuals
    • Firms
      • E.g., Bizjak, Lemmon & Whitby (2009), Chiu, Teoh & Tian (2013), Fracassi (2017)
What is social transmission bias?
Social transmission

• Signals, ideas pass from person to person

• Social transmission bias:
  • Signals, ideas, systematically modified in transfer from a sender, or observation target, to a receiver, or observer
  • Derives from both sender, receiver incentives, psychological biases

• Underexplored building block
Social transmission bias as signal distortion

1. Signal distortion
   • Shifts in **sign, intensity** of what is transmitted
     • Example:
       • Owner of a stock “talks up” the firm
       • Listener fails to discount
Social transmission bias as selection bias

2. Selection bias

• Bias in whether something is transmitted
  • Example: Self-enhancing transmission bias
    • Investors discuss their trades with high returns
    • Silent about their low returns
      • Escobar & Pedraza (2019)
    • Listeners fail to adjust
Five fables of social transmission bias in economics and finance
Fable 1:
Bandwidth constraints and simplistic thinking
Bandwidth constraints and simplistic thinking

Hirshleifer & Tamuz (in progress)

• Suppose loss of nuance as ideas communicated
  • TV “Sound bites”

• Bandwidth constraints
  • Twitter character limits
  • Time, cognitive constraints
Failure to adjust

• Suppose receivers do not adjust for loss of nuance
  • Consistent with standard limited attention effects
Outcome

Then:

• Infer senders have simple or extreme belief
• Adopt actually-simplistic beliefs
• Sequential
  • Iterated loss of nuance
• Society ➔ Extreme simplistic thinking
  • Worse than judgements made in isolation
Fable 2: Self-enhancing transmission bias
Self-enhancing transmission bias

Han, Hirshleifer & Walden (2019a)

• 2 Strategies
  • A – Active
    • Higher variance, or higher skewness
  • P – Passive

• Investors of type A or P randomly selected to meet
• Sender may report profit to Receiver
  • High more than low returns
Receivers

• Standard behavioral biases
  • Don’t adjust for selection bias
  • Think past performance predicts future performance
Result

• Upward selection bias in return reports
  • Stronger effect for high-variance strategy
• High-variance, underperforming A can spread through population
  ➔ Nondiversification, price anomalies...
• Empirical support for this mechanism
  • Escobar & Pedraza (2019)
A variation

• High salience of extremes:
  • Positive skewness strategies spread
Lessons

**Attraction** to variance, skewness:
- In the model, investors don’t **like** variance, skewness
- Don’t have **belief**
  - “High variance, skewness ➔ Good opportunity”
- May be **unaware** of variance, skewness
- Attraction **socially emergent**
  ➔ Distinctive empirical implications:
    - Personality traits (e.g., self-enhancing transmission bias)
    - Social network position
    - Overall network connectivity
Fable 3: Visibility bias and overconsumption
Visibility bias and overconsumption

Han, Hirshleifer & Walden (2019b)
- Visibility bias
- Engaging in a consumption activity often more visible than refraining
Basic idea and assumptions

- Observers don’t adjust for this
  - (a standard behavioral bias)
    ➡️ Infer others consuming heavily

- $x = \text{people’s need-for-saving}$
  - E.g., probability of a personal wealth disaster
  - Same, for all
  - Uncertainty about $x$
  - Diverse private information
Outcome

Visibility bias, naiveté

➔ People mistakenly “learn” from “high” consumption that x low
➔ Undersaving
• Self-reinforcing effect
Nonobvious consequences

• Young overconsume more than old
• Wealth dispersion (information asymmetry) **weaken**s effects
  • Opposite of wealth signaling models (Veblen effects)
Moral of the story

• No direct bias for overconsumption
  • Vs. behavioral finance
    • Present-biased preferences
      • (hyperbolic discounting)
Why should we care?

- Different empirical, policy implications
  - E.g.:
    - Disclosure helps!
    - Target interventions by position in social network
  ➔ For good policy, empirical testing vital
- Empirical support for both mechanisms
  - See, e.g., D‘Acunto, Rossi & Weber (2019)
Fable 4: (Main model)
Biased information percolation, action booms, and price bubbles
Biased information percolation, action booms, and price bubbles

• “Beyond all reason" flavor of booms, bubbles
  • Religious awakenings, Bitcoin...
Assumptions

• Continuum of agents
• Each takes an action with intensity $\theta^i_s$ in continuous time
  • E.g.
    • Engage in political action
    • Adopt an innovation
    • Buy a stock
• Random payoff $X$ per unit of activity
• Payoff realized at terminal date $T$
Signals

• Each agent endowed with one private signal about fundamental $X$

• Public signals arrive at discrete dates
  • Quarterly earnings surprises, or other discrete events

• Distributions jointly normal
Meetings and signal sharing

- Information percolation
  - Duffie, Malamud & Manso (2009)
- Meet randomly in pairs in continuous time
- Share accumulated signals
  - Or, bloggers randomly seeing others’ postings
- Per capita number of private signals grows exponentially:
  \[ \phi_s = e^{\eta_s} \]
- See Andrei & Cujean (2017)
Timeline

Random meetings to share signals

$S_i$  $S_1^P$  $S_2^P$  $S_3^P$  ...  $S_{T-2}^P$  $S_{T-1}^P$  $X$

0  1  2  3  ...  $T-2$  $T-1$  $T$

Trading
Transmission bias

Two key transmission biases

I’ll focus on:

• $b$-bias
  • In each meeting, a bias of $b$ added to average signal
**b-bias**

$b > 0$:
- Empirical literature, senders tend to **transmit positively**
  - Berger & Milkman (2012), Berger (2014)
  - Helps senders be perceived as useful by receivers
    - E.g., if short-selling of products or stocks is rare
    - Senders like to be viewed as positive people

$b < 0$:
- **Negativity bias** in observer attention, perceptions
  - Rozin & Royzman (2001), Baumeister et al. (2001)
    - Evolutionary underpinnings
$b$-bias

- $b$ added to average signal each meeting
  \[ \Rightarrow \]
  $b$-bias **recursively amplified**
  \[ \Rightarrow \]
  Even if $b \approx 0$, big effects

- But if $b \approx 0$, people may mistakenly use a “$b = 0$” heuristic.
The decision problem

- Mean-variance preferences
- Myopic decision-making at each date $s$
Two model versions

Action Booms Model
• Aggregate action endogenous
  • E.g., political activism

Price Bubbles Model – My focus tonight
• Action:
  • Buying a single risky security
• Aggregate buying = Exogenous aggregate supply shock
• Price endogenous
  • Learning from price
Expected price path

• Multiplicative growth in:
  • Per capita signal count
    • Exponential
  • Per-signal bias

→ Convex growth
  • For a while
Correction

- Public news arrival of increasing precision
  - Bubble eventually corrects
- Hump-shaped expected price path
  - Or U-shaped when $b < 0$
Expected price path in Price Bubbles Model: Smoothed
Evidence and comparison

• Expected price starts growing slowly, accelerates
  • Initial convexity
    • Consistent with evidence of Greenwood, Shleifer & You (2019)

• Price bubble
  • Without usual ingredients
    • Overconfidence, overextrapolation
Predictability of expectations and returns

• Smoothed expected price path
  • Similar to behavioral models that generate momentum, reversal
• After price run-ups, beliefs more optimistic
  • Supporting evidence
    • Greenwood & Shleifer (2014)
  • Emergent effect
    • Accumulation of b-bias
    • High returns do not cause overoptimism
    • No extrapolation
• Disagreement, trading rises, falls with bubble
Event-based return predictability

• Corrective public information (earnings) arrives at discrete dates
  • News-date returns predictable
• Post-news-event return predictability
• Other return predictability patterns
Actual Expected Price Path—Stegosaurus

E[\nu_s|b]

Expected Price Path

Actual

Smoothed

Time (s)
Oscillation and unifying anomalies

- Oscillations in expected price path
  - Short-term reversal too—unifying anomalies?
    - If high frequency public news arrival
Peak instability

• Tug-of-war
  • Biased percolation
  • Public news arrival
  • Before the peak, percolation wins

• So oscillation intensifies near the peak
  • Peak instability
    • Empirically testable

• Damped oscillations as bubble subsides
  • “Dead cat bounce”
Fable 5: Biased transmission of folk models
Biased transmission of folk models (work-in-progress)

Folk model:

- An understanding of how the world works.
  - E.g.,
    - Belief in Heaven and Hell
    - Payback criterion for capital budgeting
Folk models spread from person to person

- Drive human behavior, markets?
- Often shaped by vivid narratives
  - Shiller (2017, 2019)
- Or, mundane beliefs about correlations, cause & effect
Example of competing folk models

- Return continuation
  - “The trend is your friend”
- Return reversal
  - “Buy on the dips"
- Behavioral finance
  - Taken as given
- Social finance
  - Spread contagiously
Compartmental models from epidemiology

- Infection spreads through population via random contacts
- Proposed that SIR Model helps explain:
  - Spread of folk models, behavior
  - Epidemic rise-and-fall time path
SIR Model epidemic curve

3 types in population:

\( \mathcal{S} \) (Susceptible)

\( \mathcal{I} \) (Infected)

\( \mathcal{R} \) (Resistant/Removed)
SIR model assumptions

- At start, almost all $S$
- In a meeting, probability that $S$ becomes $I$
  - Measures transmission bias
- Random recovery
  - $I$ randomly becomes $R$
- Self-reinforcing effects
Adapting compartmental approach

- To transmission of **folk models**
  - Effects on **economic behaviors**

- “Infected”
  - Folk model ➔ Overoptimism
    - Overestimate expected terminal dividend
SIRS model + **Buzz** + **Asset market**

- $S$: spontaneously $\mathcal{R} \rightarrow S$
  - Standard SIRS model

- Introduce an asset market
  - Somewhat like Fable 4
Buzz

• Growing excitement makes folk model more contagious
• Transmission bias toward $\mathcal{I}$ increasing in buzz, $\dot{I}$
  • E.g., Bitcoin “hot” ⇒ Meetings more persuasive
• Negative buzz
  • Meetings trigger recovery from the folk model
    • Vs. disease models
    • Meetings never cure infection
Effect of buzz

• Exaggerates
  • Boom on way up
  • Collapse on way down
• Intensifies self-reinforcing feature of bubbles
Price Path:
Modified SIRS model with Buzz
Damped oscillation

• Bubble collapse
  • Correction can overshoot

→

Damped oscillation
in $I$ fraction, stock price

• Suggests rich return autocorrelation patterns
Emergent themes
Emergent theme (1): Compounding

1. Social transmission bias compounds recursively.
   • Small bias can have large effects.
Emergent theme (2): Idiosyncrasy

2. Social transmission bias helps explain the idiosyncrasy of aggregate outcomes.
   - Error-prone, unpredictable
   - Sensitivity to small biases, shocks
Emergent theme (3): Dynamics

3. Social transmission bias offers an endogenous social explanation for action booms, price bubbles, and swings in investor sentiment.
   - Without “standard” ingredients for bubbles
Emergent theme (4): Emergence

4. Socially emergent behavior often look completely different from individual propensities.

- Self-enhancing transmission and attraction to volatility
- Visibility bias and overconsumption
Emergent theme (5): Mimicry

5. Social emergence can easily create the illusion of a direct individual propensity “for” a behavior when no such propensity exists.

- Apparent lottery preferences
  - Self-enhancing transmission model
- Apparent present-oriented consumption preference
  - Visibility bias model
- Apparent extrapolative beliefs
  - Biased percolation model

- We often overstate inferences from empirical tests.
Emergent theme (6): 
Proxies

6. The social transmission bias approach suggests **new** test variables.

**General social:**
- Sociability
- Communication technologies, media
- Individual social network position
- Overall social network connectivity

**Sources of transmission bias:**
- Psychological traits
- Environmental cues
- Content of folk models
- Textual characteristics
In closing
Social economics and finance as a research opportunity

• We academics sometimes caught in closed loops
  • At worst, ritualistic cycles
    • At best, blinders

• John Keats felt:
  ...like some watcher of the skies
  When a new planet swims into his ken...

• Outline of a new field of inquiry now discernable:
  • Social economics and finance
    • Networks, folk models, social transmission bias