MW24.2 Experimental Economics (SS2022)
Information Cascades

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Mechanisms for Uniform Social Behavior

* sanctioning of deviants
* positive payoff externalities
* preferences for conformity
* communication

⇒ mass behavior that is *not* fragile (w.r.t. minor external shocks)

⇒ new members reinforce the phenomenon

Bikhchandani et al. [1992] argue that uniform social behavior is better explained by *social learning* ∼ situations where individuals can learn by observing the behavior of others:

⇒ "information(al) cascade" or "herd(ing) behavior" model(s)

Info cascade ∼ situation where it is *optimal* for an individual, having observed the actions of others, to do the same while disregarding his private information

Core assumptions:

* Bayesian learning
* incomplete asymmetric information
* pure information externality
* once-and-for-all decision
* exogenously defined sequence of moves

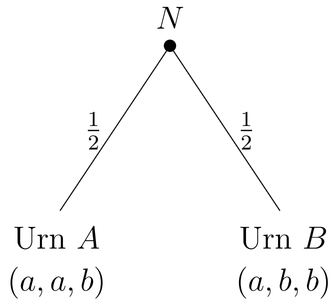
Anderson and Holt [1997] Information Cascade Model

There are two states of the world, A and B. A random sequence of individuals each receive a signal about the state of the world, a or b, and must guess the true state. All decisions, but not signals, are public.

The signal is (i) *imprecise* but (ii) *informative*:

(i) $P(a|A) = P(b|B) = \frac{2}{3} < 1$

(ii) $P(a|A) = P(b|B) = \frac{2}{3} > \frac{1}{2}$



signal precision:
$P(a|A) = P(b|B) = \frac{2}{3}$

Both states of the world are equally likely *ex ante* and the signals are i.i.d.

⇒ suitable environment for studying errors in decision making as the players can learn from the decisions of others without any *payoff* interdependencies, and errors (if any) are *recursive*, i.e., past mistakes influence the decisions of future individuals

Normative expectations (for rational Bayesian players):

1. The first decision maker has his individual signal only and hence predicts A upon drawing a, and B otherwise.

2. If the second decision maker has a *non-conflicting* signal, he follows suit. Otherwise, his *posterior* belief of the true state being A is equal to $\frac{1}{2}$ as he can *infer* the first signal from the decision of the first agent and has his own (conflicting) signal on top of that. If indifferent, he is assumed to follow his own signal.

3. Before observing his own signal, the third decision maker can make the following inference: $AA \to aa$, $AB \to ab$, $BA \to ba$, and $BB \to bb$.
   For any (inferred) sequence of *two* signals that are *the same*, he then completely *disregards* his own signal if it is different.

⇒ By induction, an *imbalance of two* decisions in the sequence forces the decision maker to disregard his private signal → *information cascade* starts.

exa) $ABB + \begin{cases} a \to ABBA & \Rightarrow \text{player five will } \textit{use his signal} \text{ to decide} \\ b \to AB\underline{BB} & \Rightarrow \text{player five will have to } \textit{disregard his signal} \end{cases}$

⇒ Individuals *rationally* take *uninformative* imitative actions.

⇒ All the decisions after the cascade develops convey *no information* about the private signals and as such, are *not informative* of the true state of the world.

⇒ Cascade is based on information only slightly more informative than a single private signal and as such, is *fragile*.

exa)

signals:	a	b	b	a	b	b	a	a	a	a	a
decisions:	A	B	B	A	B	B	B	B	B	B	B

$$
\begin{aligned}
P(A|\#a,\#b) \equiv P(A|n,m) &= \frac{P(n,m|A)\cdot P(A)}{P(n,m|A)\cdot P(A)+P(n,m|B)\cdot P(B)} = \\
&= \frac{(2/3)^n\cdot(1/3)^m}{(2/3)^n\cdot(1/3)^m+(1/3)^n\cdot(2/3)^m} = \\
&= \frac{2^n\cdot(1/3)^{n+m}}{2^n\cdot(1/3)^{n+m}+2^m\cdot(1/3)^{n+m}} = \frac{2^n}{2^n+2^m}
\end{aligned}
$$

Note that $P(A|n,m) \lesseqgtr \frac{1}{2} \iff n \lesseqgtr m$. Hence one need not be a perfect Beyasian learner to be in line with the normative prediction but instead, could rely on a *counting* heuristic when making decisions in this setup!

Bikhchandani et al. [1992] general theoretical predictions:

* reducing signal precision delays the start of a cascade
* increasing signal precision raises the probability of a *correct* cascade
* even for relatively precise signals, the probability of an *incorrect* cascade is quite high (e.g., ~ 0.2 for the signal precision of 0.7)
* cascades will never stop without external shocks
* if the signals vary in precision, the society is better off with the *least* precise signals used first
* cascades are *fragile* $\sim$ they don't get stronger with more adopters
* cascades are *idiosyncratic* $\sim$ their direction depends on the very few early signal realizations
* public release of information *after* the cascade has developed is always beneficial to the society

Anderson and Holt [1997]

- ∼ people need not be Bayesian learners (e.g., they could be using the *counting heuristic* or disregarding public information altogether instead)
- (!) rationality of others is required for the normative predictions
- * 6 decision makers $\times$ 15 repetitions
- * $2 for a correct prediction and nothing otherwise
- * symmetric and asymmetric urn treatments (to test for counting)

Results:

- ⇒ not all decisions are in line with Bayesian learning [Table 2]
- ⇒ if following the private signal is not consistent with Bayesian learning, 26% of the subjects go with their private signal
- ⇒ $\frac{2}{3}$ of the subjects are consistent with Bayesian learning; another $\frac{2}{9}$ make use of the public information
- ⇒ logit model of errors indicates that the subjects "make mistakes" but those are rather small so it is still optimal to follow a cascade
- ⇒ 57 out of 68 cases are not consistent with the *status-quo* bias
- ⇒ 10 out of 10 cases are not consistent with the *representativeness* bias (note footnote 32 for later)
- ⇒ if the Bayes rule and counting heuristic disagree, the former is followed in 41 out of 82 cases [Tables 4–6]
- ⇒ if counting makes no prediction, 66% of decisions are consistent with the Bayes rule
- ⇒ overall, 115 out of 540 cases are not consistent with Bayesian learning (asymmetric treatment), with $> \frac{1}{3}$ explained by counting
- ⇒ overall, the cascades form in 87 out of 122 cases
- ⇒ one third of the cascades is of the reverse (i.e., incorrect) type
- ⇒ one third of the subjects tends to rely on the counting heuristic if it disagrees with the Bayes rule

Suggested Literature

- Charles A Holt. *Markets, games, & strategic behavior*. Boston Pearson Addison Wesley, 2007 [Chapter 31]
- Sushil Bikhchandani, David Hirshleifer, and Ivo Welch. A theory of fads, fashion, custom, and cultural change in informational cascades. *Journal of Political Economy*, 100(5):992–1026, 1992
- Lisa Anderson and Charles Holt. Information cascades in the laboratory. *American Economic Review*, 87(5):847–62, 1997

* Angela A. Hung and Charles R. Plott. Information cascades: Replication and an extension to majority rule and conformity-rewarding institutions. *American Economic Review*, 91(5):1508–1520, 2001