Cheap Talk II: Extensions and Applications

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REVIEW

- Adding the possibility of cheap talk may improve/enrich outcomes.
- A small amount of conflict of interest severely limits communication in equilibrium.
- Increasing the similarity of preferences increases the effectiveness of cheap talk.
- NITS selects from multiple equilibria

Sir Philip Sidney

- Preferences: $U^S(a,t) = (1-a)(1+ky) + a(t+k)$
  $U^R(a,t) = a(1+kt) + (1-a)(y+k)$.
- k degree of relationship.
- y fitness of "mother."
- Like CS, but not smooth and Sender likes lower value of a.
- Apply NITS at $t = 1$.
- Conflict of interest: self interest dominates.
- Common interest: if k is large and t is large, then both sides want a to be low.

Equilibrium

1. At most two actions induced in equilibrium.
2. Babbling Equilibrium Exists
3. $$y^* := \frac{y}{k} + 1 - \frac{1}{k}. \qquad (1)$$

   The Receiver finds it uniquely optimal to set $a = 0$ if $\mathbb{E}[t|m] < y^*$, uniquely optimal to set $a = 1$ if $\mathbb{E}[t|m] > y^*$, and is indifferent over all a otherwise.

Results

- The babbling equilibrium satisfies NITS if and only if $\mathbb{E}[t] \geq y^*$.
- A two-step equilibrium exists if and only if

$$\mathbb{E}[t | t < 1 - k(1 - y)] \leq y^*. \tag{2}$$

- If a two-step equilibrium exists, it satisfies NITS.
- If the one-step equilibrium fails NITS, then a two-step equilibrium exists.
- If the one-step equilibrium satisfies NITS, a two-step equilibrium may or may not exist.

TWO SENDERS

- Many situations in which there are multiple sources of information.
- R can "balance" sources to obtain better information.

MODEL

- Maintain assumptions about preferences, biases, ...
- Add another sender, so $U_i^S(a, t) = -(a - b_i - t)^2$ for $i = 1, 2$.
- Important: Both Senders observe the state perfectly.
- Assume general domain of state (T).

Note: If three fully informed senders, it is easy to get a fully revealing equilibrium.
Results depend on the "size" of the domain.

GUESS WHAT HAPPENS

1. Does solution depend on location of b_i?
2. Is full revelation possible?

THEOREM ON FULL REVELATION

An equilibrium in which R can infer t from the two reports.
There exists a fully revealing equilibrium if and only if:
for all t and $t' \in T$,

$$B(t' + b_1, |b_1|)) \cup B(t + b_2, |b_2|)$$

does not contain T.

$B(t + b_2, |b_2|)$ is
the set of actions that are better for the second Sender than t.
The condition states that there must always exist a state – and therefore an action for R – that is simultaneously worse than t for both S.
If the condition holds, then take the mutual punishing action when reports conflict.
If condition fails, then no mutual punishing action can exist.

ONE DIMENSIONAL VERSION

Full revelation if and only if the sum of the absolute values of the biases is less than half the length of T.
That is, if the biases of the two sources are small enough, then full revelation is possible.

MULTI-DIMENSIONAL INTUITIONS

Assume one Sender, first component of bias is 0.
S and R agree on one dimension and, assuming independence, full revelation along that dimension is possible.
In general, there is the possibility of a "dimension" of agreement.
With two senders, if the dimensions of agreement are different, full revelation is possible.

MORE ON MULTIPLE DIMENSIONS

Previous example suggests that additional dimensions creates the possibility of more shared interests.
This general insight is true. There are intuitive situations in which categorical statements (ranking of dimensions) are credible.

APPLICATION OF MULTI-SENDER MODEL

Think of a legislative committee decision making problem in three parts:

1. Two Committee Members
2. A Legislature (Decision Maker)

MODEL

- Committee members are Senders with bias b_i.
- Action $x = a + t$.
- Legislature is Receiver with bias 0, $U^R(a, t) = -x^2$.
- $U_i^S(a, t) = -(x - b_i)^2$.
- Senders know t.
- $t \in [0, 1]$ uniformly distributed.
- $p_0 \in [-1, 0]$ is status quo.

COMPARE EFFICIENCY PROPERTIES OF RULES

- OPEN RULE: Standard Cheap-Talk, with "talk" interpreted as a proposed policy.
- CLOSED RULE: S_1 proposes; S_2 talks; R picks either status quo or S_1's proposal.
- MODIFIED RULE: OPEN, but R must pick either status quo or one of two proposals.

If committee is homogeneous (equal biases), last two rules are equivalent.

OPEN RULE

Full revelation if biases are small by earlier result.

CLOSED RULE

S_1 can restrict outcome to status quo with appropriate proposal.
This will be optimal when the status quo is optimal for S_1:

$$p_0 + t = b_1$$

In fact, the most informative equilibrium involves:

- the status quo for t near $b_1 - p_0$.
  (Both S_i like SQ.)
- Full information for t extreme.
  (Both S_i prefer t to $p_0 + t$).
- Compromise: Leaving both Sender types at least as well off as status quo.
  If S_i prefers status quo to R's ideal, then compromise will lead majority to be indifferent between SQ and ideal.

MODIFIED RULE

This works the same as Open Rule.
Reason: It is sufficient to use one of the senders' proposals or the status quo as a punishment.

COMMENTS

Results suggest that Open and Modified Rules are better for efficiency.
US congressional committees use closed rules.
Why?

- Equilibrium Selection.
- Distributional concerns.
- Bad model.

VARIATIONS

- Noisy observations. (Full revelation is not robust.)
- Costly information acquisition.
  What happens in a proposal game in which senders must decide whether to acquire information?
  How does this depend on the rule and the order of communication?
- Is the status quo safer?
  Alternative assumptions on modeling uncertainty.

REPUTATION CONCERNS

Basic Idea: Newspapers tailor reports towards biases of readers to create reputation for quality.

THE MODEL

- Binary state, action, signal, symmetric payoffs:
  $u(i,i) = 0$, $u(i,j) = -1$ if $i \neq j$.
- Newspaper has two intrinsic, unobserved quality levels. Perfect: learn state. Imperfect: receive signal that is accurate with probability $p > .5$.
- λ probability newspaper is perfect.
- $\pi > .5$, π_N (potentially) different priors that state is 1 for readers and newspaper.
- $\pi < p$: information changes readers' optimal action in the sense that a signal for state zero lowers posterior below .5.
- $\pi_N \in (1-p, p)$. Newspaper's posterior is below .5 if signal is 0; above .5 if signal is 1.

THE GAME

- Everyone buys.
- Firms care about reputation.
- Reputation formed by updating prior based on incomplete feedback on accuracy.
  With probability μ reader learns true state. With probability $1 - \mu$ the reader learns nothing.
- Perfect firms report truthfully.
- Imperfect firms report strategically

Imperfect firms generally have an incentive to report dishonestly to improve reputation.
In particular, when $\pi > .5$, equilibrium involves imperfect firms always reporting 1 when their signal supports 1 and sometimes reporting 1 when their signal supports 0.

BASIC INTUITION

The stronger the prior favors state 1 (π higher) and the weaker the feedback (lower μ) the better the reputation of someone who reports 1.

VARIATION

- Model competition as process by which readers gain feedback.
- One paper receives information as above and makes report.
- Other papers get perfect information and can make reports.
- If (a) other papers report honestly and (b) the probability of a reader receiving a secondary report is increasing in the number of papers, then one obtains the technology of the monopoly case.
  One difference: increasing competition leads to higher μ.
  That is, more competition leads to better feedback, which leads to less bias.

Heterogeneous Readers

Assume that there are two groups of readers who differ only in their prior.

$$\pi_0 < .5 = \pi_N < \pi_1.$$

One can construct an equilibrium in a market with two papers in which the papers segment the market, acting as monopolists to subgroups of reader.
A reader biased towards state one prefers a newspaper biased towards state one because the paper reports honestly with higher probability.

COMMITTEE DESIGN

Ottaviani-Sorensen
Preferences of Decision Maker:
Standard from symmetric 2 action, 2 state voting model
$(u(i,i) = 0; u(i,j) = -.5, i \neq j)$.
Expert advisors get signal, informative, binary signal. Variations:

- Experts differ in quality.
- Experts care about the probability that they are viewed as good.

THE GAME

1. Decision maker orders experts.
2. Experts get signals.
3. Experts speak (publicly) according to the order.
4. Decision maker acts.
5. True state revealed.
6. "Market" compensates experts.

Questions: How to organize debate to obtain best decision? How do experts behave?
In particular, do experts truthfully report signal?

RESULTS

1. Informative equilibrium if and only if $p_i > \max\{q_i, 1 - q_i\}$. Experts with "unexpected" signal will herd to preserve reputation. p_i precision of expert i; q_i beliefs of that expert (when it is her turn).
2. Letting best expert speak first suppresses communication.
3. But speaking in inverse order of expertise need not be optimal.
4. Generally incomplete revelation with herding.
5. Otherwise few interesting general results.

For More Information

I will post on my UCSD webpage lecture notes, annotated references, and an encyclopedia article.

Contact me (jsobel@ucsd.edu) with corrections, questions, comments, requests for references, interesting research.

Thank you