Xiaokai Yang Memorial Lecture

Reputations

George J. Mailath

Yale and UPenn

http://pantheon.yale.edu/~gm285

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Introduction

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But what is a reputation? Two views:

- one motivated by repeated game considerations, and
- the other by incomplete information.

I will argue that the repeated-game view of reputation is not particularly helpful, and that the approach based on incomplete information, while capturing some important intuitions, often requires some mechanism to maintain asymptotically uncertainty about an agent's characteristics.

An example (a restaurant)

Simultaneous move stage game:

	buy expensive	buy cheap
high effort	$2, 3$	$0, 2$
low effort	$3, 0$	$1, 1$

Row player (1, “he”) is a restaurant.

Column player (2, “she”) is a consumer.

Stage game has unique equilibrium: (low effort, buy cheap).

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If the restaurant must close by some predetermined date (i.e., the rest't is finitely lived), in the unique equilibrium outcome (low effort, buy cheap) occurs in every period.

On the other hand, if the restaurant lives forever and cares sufficiently about the future, there are many equilibria (the folk theorem):

(low effort, buy cheap) in every period is still an equilibrium outcome.

(high effort, buy expensive) in every period is also an equilibrium outcome.

The (high effort, buy expensive) outcome is supported by a trigger strategy: the "threat" of reversion to the (low effort, buy cheap) regime if the restaurant ever shirks.

Often interpreted as: if the restaurant were to shirk by choosing low effort, then he would immediately lose his "reputation" for high effort.

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But should one period of low effort result in such a dramatic loss of reputation?

More plausible to allow for imperfect monitoring of the restaurant's effort.

Imperfect monitoring of effort: public signals $\{G, B\}$, G is good meal and B is bad. Distribution:

$$\Pr\{y = G | ij\} = \begin{cases} p, & \text{if } i = \text{high effort}, \\ q, & \text{if } i = \text{low effort}, \end{cases}$$

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Ex post payoffs to consumer

	buy expensive	buy cheap
G	$3\,(1-q)\,/\,(p-q)$	$(1-2q+p)\,/\,(p-q)$
B	$-3q/\,(p-q)$	$(-2q+p)\,/\,(p-q)$

Expected payoff to consumer from (high, expensive) is

$$p \times \frac{3(1-q)}{(p-q)} + (1-p) \times \frac{-3q}{(p-q)} = 3.$$

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Again, there is significant multiplicity, though not quite a folk theorem: For high discount factors (δ), every payoff in the interval $[1, \bar{u}]$ is a restaurant eq payoff, where

$$\bar{u} \equiv 2 - \frac{1-p}{p-q} < 2 = u_1(\text{high}, \text{expensive}).$$

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A "trigger" equilibrium supporting high effort initially has the restaurant choosing high effort in the first period, supported by the threat of reversion to the (low effort, buy cheap) regime if a bad meal (B) is over observed. Also consistent with equilibrium to return to high effort after sufficiently long (low effort, buy cheap) regime (Green and Porter, 1984).

However (since this is similar to a folk theorem):

This explanation is too powerful. It can support outcomes such as (low effort, buy cheap) on prime dates, and (high effort, buy expensive) at all other times.

Moreover, in richer environments, such "reputations" can support outcomes with very low payoffs for both rest't and consumers.

Repeated game-type arguments do not provide a theory of reputations.

Incomplete information

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The restaurant as previously described is the normal type.

Two possibilities of interest:

Commitment types and inept types.

A commitment (or Stackelberg) type necessarily chooses high effort in every period.

An inept type necessarily chooses low effort in every period.

Reputation as separation

The restaurant is either inept or normal.

Ex ante, consumers do not know the type of the rest't, with prior $0 < \phi_0 < 1$ on normal.

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There are many equilibria.

Consider Markov perfect equilibrium—behavior of all agents depends only on the beliefs of the uninformed consumers.

Can the desire to separate from inept types provide a rationale for a high effort reputation?

Thm (Mailath and Samuelson (2001)) Suppose $p = 1 - q$. There is a unique Markov perfect equilibrium in pure strategies, and in this eq, the rest't always chooses low effort.

(Role of $p = 1 - q$ is to rule out an "irritating" equilibrium.)

Intuition:

Candidate eq where normal rest't always chooses high effort.

Eventually, if the rest't is indeed normal, uninformed consumers assign a probability very close to 1 they face a normal rest't.

Any one bad meal (indeed, any finite sequence of bad meals for sufficiently high beliefs) does not change the belief of the consumers enough to lead to buy cheap.

But then, at that point the normal rest't has no incentive not to choose low effort.

Perpetual uncertainty

Problem is consumers become too confident about the type of the rest't.

Suppose the type of the rest't is subject to unobserved shocks. In particular, in each period, with probability θ, the rest't's type switches from normal to inept (chef is replaced) and conversely (though this is less important).

Consumers do not observe a switch, if it occurs.

Now, consumers can never be too confident about the type of the rest't.

Suppose c is cost of effort (above, $c = 1$).

Thm (Mailath and Samuelson (2001)) Fix the switching probability $\theta \in (0, 1)$ and the discount factor $\delta \in (0, 1)$. If effort is not too costly (i.e., there exists $\bar{c} > 0$ such that $c \in (0, \bar{c})$), there is a Markov perfect eq in which the normal type of rest't always chooses high effort.

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In this eq, when beliefs are pessimistic, consumers buy cheap since they assign high probability to the rest't being inept. Nonetheless, the normal rest't chooses high effort in an attempt to signal to consumers (recall monitoring is imperfect) that the rest't is not inept.

Reputation as pooling

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$\Longrightarrow$ rules out implausible outcomes ((low, cheap) in every period is not an eq) as well as allowing outcomes that otherwise would not be consistent with eq. Result is general.

Asymptotic reputations

Consider Markov equilibria.

As before, state is consumers' posterior belief that rest't is normal.

In equilibrium, in every period normal type must choose low effort with positive probability.

$\Longrightarrow$ eventually consumers learn that the rest't is normal.

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What about other equilibria?

(Markov perfect in complete information game $\Longrightarrow$
(low effort, buy cheap) always).

Some intuitions

Suppose consumers do not learn rest't's type.
Then $\exists$ an eq with both types given positive probability in the limit.

$\Rightarrow$ consumers cannot distinguish between signals received from two types

$\Rightarrow$ they believe normal and commitment types playing same strategies.

$\Rightarrow$ they should be buying expensive.

The normal type can then benefit by choosing low effort for 1 period.

Contradiction of Equilibrium

Impermanent reputations

Consumers' posterior belief in period t that rest't is the commitment type is p_t.

Thm: (Cripps, Mailath, and Samuelson (2004, forthcoming)) In any Nash eq, if the rest't is normal, with probability one, $p_t \longrightarrow 0$.

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Asymptotic equilibrium play

Thm: In any Nash eq, if the rest't is normal, with probability one, behavior converges to a Nash eq of the complete information game.

Asymptotic restrictions on behavior

Moreover:

Given any prior p_0 and any δ, for all $\varepsilon > 0$, there exists a Nash equilibrium of the incomplete information game, such that, if the rest't is normal, the probability of the event that eventually low effort/buy cheap occurs in every period is at least $1 - \varepsilon$.

This is true even if the prior and discount factor pair, (ρ, δ), is in the parameter region where the reputation bound of Fudenberg and Levine is valid.

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If reputation is due to a desire to separate from inept types, then need perpetual uncertainty about types to have any eq reputation.

If reputation arises from the possible existence of commitment types, then reputation is transitory in the absence of perpetual uncertainty. (In some situations, this is enough—the establishment of a new institution.)

However, uncertainty about types is continually refreshed (Holmstrom '82, Cole, Dow, and English '95, Mailath and Samuelson '01, Phelan '06).

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