Informational Cascades Are Good, Not Bad

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Abstract

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I would like to thank sdfdsf

1. Introduction

There are N identical players, who make decisions, $y_i \in \{0,1\}$ to vote No or Yes on an action depending on whether the true state $x \in \{0,1\}$, is Bad ($x=0$) or Good ($x=1$), each state having equal prior probability. We will say that to vote Yes costs some very small amount ϵ as a tiebreaker, so with no information, everybody votes No. Player i exerts effort $e_i \geq 0$ to obtain a signal $s_i \in (\{0,1\}$ of the state, where we will call these signals BAD ($s_i = 0$) and GOOD ($s_i = 1$). A player only observes his own effort and his own signal.

Let us assume for simplicity that a Bad state always generates a BAD signal: $Prob(s_i = 0|x = 0) = 1$. A good sstate, however, might still generate a BAD signal: $Prob(s_i = 1|x = 1) = f(e_i) = 1 - .5/(1 + \alpha e_i)$, which goes from .5 for low e_i to 1 for high.

Utility is $u_i = v(|y - x_i|; |y - x_1|, \ldots |y - x_N| \; for \; i \neq j) - e_i^2 - y_i\epsilon$, where we will want v to be bigger if y is nearer to x, where "nearer" will be defined more precisely later. For now, we can restate that as $\frac{du_i}{dy_i} > 0$ and $\frac{du_i}{dy_j} \geq 0$

Those are the assumptions, but some notation will also be useful. Let $\overline{y} = \frac{\Sigma_{i=1}^N}{N}$ denote the average vote. Let $\hat{x}_i$ denote player i's posterior belief after viewing his own signal and whatever votes he can see before he must decide how to vote.

Consider various regimes.

The Simultaneous-Decision Regime. The players choose information-gathering effort and make their decisions without knowing the other players' votes, simultaneously.

The Sequential-Decision Regime. Player 1 chooses his information-gathering effort, which is unobservable, but then chooses his vote, which players 2 through N observe. Player 2 then chooses his effort and vote, with the vote observed by everyone else, Player 3 chooses, and so on until player N.

The Pooled-Information Regime. All the players choose their information gathering effort simultaneously. They then reveal their "straw votes" simultaneously (it does not matter whether they do this sequentially or simultaneously since they have no incentive to lie). Then they choose their "actual votes"— the ones that enter the utility function–simultaneously (and, again, this could be sequential and it would make no difference).

The Classic Model

In the classic model of Bikh et al there is no effort, so $f(e_i) = \theta > .5$, contrary to our assumption above. Also, $v_i = v(|y - x_i|)$, which is to say that player i's utility is only affected by his own vote, not anybody else's. We will start with that model.

The big lesson of Bikh et al is that the Pooled-Information Regime is better than the Sequential-Decision Regime. If people vote sequentially, the votes of only the first few people will be informative, and the information of everyone after that is completely wasted.

What is not noted, but should be, is that the Sequential-Decision Regime is second-best. Cascades are good. Without cascades, people would make worse decisions. They only look bad because in comparison with an ideal situation in which everybody could consult together and pool their information, even at a coarse level, they could do even better.

The Model with Costly Information

We'd like to make a second point: information is costly, the advantage of sequential over simultaneous information rises and the disadvantage of sequential versus pooled-information falls. This is because if information is costly, we do not necessarily WANT to get information from most of the players. If information is redundant and replicative, it is a bad thing, not a good thing, once we take into account the cost.

Utility is $u_i = 1 - |\overline{y} - x| - e_i^2$

We will later consider the utility function $u_i = 1 - |y_i - x| - e_i^2$

We will also later consider risk aversion, which would mean that a further-off wrong decision is worse, as with $u_i = 1 - (\overline{y} - x)^2 - e_i^2$.

Our goal is to decide between two regimes, Sequential and Simultaneous.

SIMULTANEOUS. The player simultaneously pick their effort levels, receive signals, and vote.

(We should also look at a regime where they pick effort simultaneously, but vote after combining information. One where they pick effort simultaneously but vote sequentialy wouldb e no different.)

Player i will vote based on just his own signal. If he exerts effort e_i and receives signal BAD he will vote No. If he receives signal GOOD, his posterior probability is

$$\hat{x}_i = [1 - .5/(1 + \alpha e_i)](1) + [.5/(1 + \alpha e_i)][0] = 1 - \frac{.5}{1 + \alpha e_i}$$

He will vote Yes if he sees GOOD and No if he sees BAD.

If the state is Bad, with probability .5, both players will see BAD and vote No.

If the state is Good, with probability .5, the players see GOOD and votes Yes with probabilities $1 - .5/(1 + \alpha e_1)$ and $1 - .5/(1 + \alpha e_2)$, and otherwise vote No.

The other player's action won't matter to his effort decision.

Maybe this is easier in general form. Player 1's expected utility is

$$\begin{aligned} Eu_1 &= .5(1 - |0 - 0|) + .5[f_1 f_2 (1 - |1 - 1|) + f_1(1 - f_2)(1 - |.5 - 1|) + (1 - f_1) f_2 (1 - |.5 - 1 \\ &= .5 + .5 f_1 f_2 + .25 f_1 (1 - f_2) + .25(1 - f_1) f_2 - e_1^2 \\ &= .5 + .5 f_1 f_2 + .25 f_1 - .25 f_1 f_2 + .25 f_2 - .25 f_1 f_2 - e_1^2 \\ &= .5 + .25 f_1 + .25 f_2 - e_1^2 \end{aligned}$$

Differentiating yields

$$.25 \frac{df_1}{de_1} - 2e_1 = 0$$

so

$$e_1^* = .125 \frac{df_1}{de_1}$$

That might have a corner solution at 0.

SEQUENTIAL. Player 1 chooses effort and votes, observed in his voting (and perhaps in effort) by player 2. Then player 2 chooses his effort and votes.

The first player will vote based just on his own signal and will follow his signal in equilibrium. The second player will vote based on his own signal and the first player's vote. If player 1 votes No, player 2's posterior is

$$\hat{x}_2 =$$

Wait: player 2 has very few possible strategies. If his signal matches player 1's vote, he will vote with him. If it doesn't, he will still vote with him, because player 1 will exert more effort. Havnig the prior be .5 is special.

The first player will choose more effort than in the simultaneous model, because his effort counts more. The second player will choose lower effort, and might choose zero effort if α is big enough. (of coure, the first player would choose zero effort also, if α is REALLY big).

The simultaneous model will generate more total effort and information. It also is better for the first player. The hard question is which generates more utility for the average player. Would the two players agree that the sequential regime is better, if they agree that they'll flip a coin to decide who goes first?

The sequential regime uses information more efficiently, because the second player can rely a little bit on the first player's information, indirectly, even though he can't observe it. Thus, I think it has to be better.

What is the first-best simultaneous and the first-best sequential regime? The sequential regime is better under the first-best in certain cases. If the first player votes No, then the second player may choose zero effort and vote No also.

Do this three ways. First, in this model with functional forms. Second, in the same model but with very general functions. Third, totally verbally. This would be important– to show that all three can get to the same result.

discussion: There are several problems: 1. The benefit from player 1's effort partially accrues to player 2. 2. Player 1's effort only determines his own vote, but player 2's vote also affects player 1's payoff. 3. Players 1 and 2 do not observe each other's signals.

" When an individual takes an action that is informative to others, it provides a positive externality. This desirable information externality is weaker when only past actions are observed than when past signals are observed, and once a cascade starts, the information externality disappears altogether. If an individual was expected to make the error of following the private signal instead of obeying the cascade, the actions of that individual would add to the public pool of knowledge, to the benefit of followers. Such altruistic behavior by a number of individuals would ultimately lead to almost perfectly accurate decisions in the long run. Instead, individuals, acting in their own self-interest, rationally take uninformative imitative actions." (Bikh, 1999, p. 156)

This paper looks at a differnet situation: where the actions are for the gropu, not the individual. But, actually, let's look at hte ienividual case too, where it is NOT a village vote. It STILL is better to do it sequentially and get a cascade tan to vote simultaneously. In fact, that is the easy case, so do it first. What Bikh et al 1999 is saying is that best of all would be to pool all your information and then decide what to do. THat can't be done, but what can be done feasibly is to have a straw poll and then decide. Simultaneous effort might well be best then. Everyone chooses effort, votes Yes or No, and then a new vote is held, which would be unanimous for the majority opinion. Well, maybe not. There is still a gian free rider problem. Making it sequential avoids that.

I should make it that NO is the best choice, as a prior, to avoid knife-edge cases with two players getting opposite signals. Or just break Ties with NO– maybe have a tiny cost of voting NO instead of Yes. That is better.

References

Sushil Bikhchandani, David Hirshleifer and Ivo Welch (1992)"A Theory of Fads, Fashion, Custom, and Cultural Change as Informational Cascades," *The Journal of Political Economy* , Vol. 100, No. 5 (Oct., 1992), pp. 992- 1026 http://www.jstor.com/stable/2138632

Learning from the Behavior of Others: Conformity, Fads, and Informational Cascades Sushil Bikhchandani David Hirshleifer Ivo Welch JOURNAL OF ECONOMIC PERSPECTIVES VOL. 12, NO. 3, SUMMER 1998 (pp. 151-170) https://pubs-aeaweb-org.proxyiub.uits.iu.edu/doi/pdfplus/10.1257/jep