AI, Headquarters and Guijie

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1 Model

Two players: a headquarter (P) and a guijie (A). P initiates a campaign to boost sales. A successful campaign first depends on the market condition $\theta \in \{0, 1\}$, which P does not know well. With probability $q \in (0, 1)$, the campaign may be initiated at a time when the market is actually bad ($\theta = 0$). With probability $1 - q$, the campaign is initiated at a correct time, i.e., $\theta = 1$. Guijie observes a noisy signal s with $\Pr(s = 1 \mid \theta = 1) = 1$ and $\Pr(s = 1 \mid \theta = 0) = p \in (0, 1)$.

The second component of success is the guijie's effort $e \in \{0, 1\}$. Guijie bears a cost of c if $e = 1$, no cost if $e = 0$.

The final outcome of the campaign is $y \in \{0, 1\}$, and $y = \theta e$. P receives a payoff of Π_P if $y = 1$, and zero otherwise. Guijie does not profit directly from the campaign. To incentivize guijie to work, P offers a bonus b to A if $y = 1$. Both P and A are risk neutral.

The timing is as follows: (i) P initiates the campaign and signs the bonus contract b with A. (ii) Market condition θ realizes. Guijie observes $s \mid \theta$ and decides whether to exert effort e. (iii) P and A observe y and receive their payoffs.

2 Analysis

Suppose Π_P large enough. Upon observing $s = 1$, the posterior of θ is $\Pr(\theta = 1 \mid s = 1) = \frac{1-q}{1-q+pq}$. A chooses $e = 1$ iff $\frac{1-q}{1-q+pq}b - c \geq 0$.

If A has a relatively poor signal (p large), the bonus b must be large enough to compensate the effort cost spent on a bad market. If the advent of AI improves the signal of A (i.e., a lower p), the bonus b can be made smaller.

Note that $\frac{1-q}{1-q+pq}$ is also decreasing in q. As a result, with the possible aid of AI, if P is more likely to initiate the campaign at a good time, a lower bonus b will be sufficient to incentivize A to work.