Biased Advice in Dynamic Consulting

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Motivation - 1

- Consultancies are employed by clients to provide expert advice on Big Data, Strategy, Retail, Marketing etc.
- We analyze the potential conflict generated by the double-edge nature of expert advice when the ability of the client to run projects is uncertain.
- By observing consultant's advice, client learns along two dimensions:
  - Information about the current project;
  - Information about own ability (or readiness) to perform similar, future projects.
- When the client's ability is not known, what are consultancy's incentives for knowledge sharing?

Motivation - 2

There is evidence of conflicts originated in the flow of knowledge between consultancy and client:

- Consultancy "stretching": artificially expanding the relationship to present the consultant as indispensable for the client. E.g. criticisms on IT consulting for recommending complex solutions over simple ones (NHS and IT cost overruns, IBM).
- "Grabbing" business: as consultancies gain insight into industries or operations, some branch out into areas or projects of their (former) clients. E.g: Big Four expanding into Legal Services, Marketing Campaigns or Fintech.

Motivation - 3

Features of consultant-client relationships:

1. Consultancy obtains information about client's preferred strategy without advice;
2. Relationship (with the same parties involved) is often repeated;
3. Consultancy is less uncertain about own ability to perform the task compared to the client.

Preview of results

- The consultant reports strategically, biasing her report *against* (rather than *towards*) the client's information.
- Despite the bias, consultant's information is fully revealed if she is perfectly informed about client's information (fully separating equilibrium exists).
- Different inefficiencies associated to the asymmetric information intrinsic in this setup: cost incurred by the consultant in distorting the report; risk of discontinuing the relationship; not fully revealing equilibrium if the consultant is not perfectly informed about client's information.

The Model

- Two parties:
  - Client/Buyer B (he); uncertain about his ability to deal with projects.
  - Consultancy C (she); certain about her ability.
- Two periods, $t = 1, 2$. In each period, B wants to find the best estimate of parameter η_t.
- The random variables η_1 and η_2 are independent; realizations are denoted by η_t^*, $t = 1, 2$. The common prior is that η_t is distributed according to $\mathrm{N}(\eta_{0t}, \sigma_0^2)$.
- Realizations η_1^* and η_2^* are only observed later in time and cannot be contracted upon.

Information Structure - 1

In period t, both parties receive an imperfect, independent signal about η_t^* and C also knows B's signal. Specifically:

	observes realization of...	with...
B	$\eta_{Bt} = \eta_t^* + \varepsilon_B$	$\varepsilon_B \sim \theta N(0, \sigma_L^2) + (1-\theta) N(0, \sigma_H^2)$
C	$\eta_{Ct} = \eta_t^* + \varepsilon_C$	$\varepsilon_C \sim N(0, \sigma_C^2)$
	η_{Bt}	

- Observed realizations are denoted by η_{Bt}^* and η_{Ct}^*.
- θ has a prior distribution $\theta \sim$Be(α, β), conjugate with the normal. Any smooth uni-modal distribution on [0,1] can be approximated by a Beta distribution.
- Exogenous, constant variances $\sigma_H^2 > \sigma_L^2$ and σ_C^2.

Information Structure - 2

- $\mathsf{E}[\theta]$ is a measure of B's expected ability to deal with the project or his (corporate) "self-confidence".
- $\mathsf{Var}(\varepsilon_B)$ is decreasing in $\mathsf{E}[\theta]$ and it is updated during the game.
- Using the formula for the conditional variance,

$$\mathsf{Var}(\varepsilon_B) = \sigma_H^2 - (\sigma_H^2 - \sigma_L^2)\mathsf{E}[\theta].$$

Information Transmission

- After observing her signal and that of the client (η^*_{Ct} and η^*_{Bt}), C sends a report η_{Rt} to B.
- The consultancy C can distort her report away from his signal ("misreporting").
- The cost of misreporting is increasing in the distortion:

$$k(\eta_{Rt} - \eta^*_{Ct})^2.$$

Payoffs and payment negotiation

- B pays a price p_t to C for her report at the beginning of the period.
- B's payoff is $\pi_t = -\mathrm{Var}(\hat{\eta}_t)$, where $\hat{\eta}_t$ is his estimate of η_t, minus payment p_t.
- C's payoff is payment p_t minus the cost of distorting the report.
- We assume a random-proposer take-it-or-leave-it bargaining, in which B proposes with probability γ and C with probability $1 - \gamma$.
- If B and C do not reach an agreement, the relationship is terminated and the B runs the project on his own.

Timing

- $t = 0$ Nature chooses $\sigma_B^2 \in \{\sigma_L^2, \sigma_H^2\}$, η_1 and η_2.

- $t = 1.1$: B observes η_{B1}^*; B and C bargain over p_1.
- $t = 1.2$: C observes η_{C1}^* and η_{B1}^*, and reports η_{R1} to B.
- $t = 1.3$: B builds the estimate $\hat{\eta}_1$, updates θ to $\theta|\eta_{R1}$, and both parties receive their period-1 payoffs.

- $t = 2.1$: B observes η_{B2}^*; B and C bargain over p_2.
- $t = 2.2$: C observes η_{C2}^* and η_{B2}^*, and reports η_{R2} to B.
- $t = 2.3$: B builds the estimate $\hat{\eta}_2$ and both parties receive their period-2 payoffs.

Equilibrium concept: (weak) Perfect Bayesian Equilibrium

Updating

- B will use C's report to update the distribution of θ and $Var(\varepsilon_B)$, his (corporate) "self-confidence".
- Assume for now that C reports truthfully, $\eta_{Rt} = \eta^*_{Ct}$.
- Then, $z^*_t = \eta^*_{Bt} - \eta_{Rt} = \eta^*_{Bt} - \eta^*_{Ct}$ is a measure of the discrepancy between B's signal and C's report and let $Z^*_t = (z^*_t)^2$.

- **Lemma 1**. $\theta | Z^*_1 \sim p(Z^*_1)\,\text{Be}(\alpha+1,\beta) + (1-p(Z^*_1))\text{Be}(\alpha,\beta+1)$
- **Lemma 2**. $\frac{\partial \text{Var}[\varepsilon_B | Z^*_1]}{\partial Z^*_1} > 0$ and $\frac{\partial \text{Var}[\varepsilon_B | Z^*_1, Z^*_2]}{\partial Z^*_2} > 0$ for any Z^*_1, Z^*_2.

- **Intuition**: With non-strategic reporting (Bayesian updating): the higher the discrepancy Z between B's signal and an *independent* signal on the same parameter, the higher the likelihood of B's signal having high variance.

Second Period

Reporting: C reports truthfully.

Bargaining over payment p_2:

- If B and C reach an agreement, B gets report η_{R2} and he estimates η_2 with three signals, profit: Π_{AGR}.
- If B and C do not reach an agreement, B does not η_{R2} and he estimates η_2 with two signals, profit: Π_{NO}.
- If C makes the offer, she demands $\Pi_{\text{AGR}} - \Pi_{\text{NO}}$; if B makes the offer, he offers 0.
- In equilibrium C's expected payment in period 2 is $(1-\gamma)(\Pi_{\text{AGR}} - \Pi_{\text{NO}})$, which is strictly increasing in the updated $\sigma^2_{B2} = Var(\varepsilon_B)$ and therefore decreasing in B's self-confidence.

Equilibrium reporting in period 1 - Separating

Proposition 1.
(a) There exists a fully separating equilibrium (weak) Perfect Bayesian Equilibrium of the game.
(b) In this equilibrium, $\eta_{R1} \neq \eta^*_{C1}$ for all types $\eta^*_{C1} \neq \eta^*_{B1}$, while for type η^*_{B1} the report is $\eta_{R1} = \eta^*_{C1} = \eta^*_{B1}$.

Intuition

- Intuition for (a): Given the continuum of types and costly misreporting, no two types have the incentive to send the same report. For different types, costs of misreporting are different, but gain in terms of expected payment is the same.
- Intuition for (b): Suppose that a type $\eta^*_{C1} \neq \eta^*_{B1}$ reports truthfully; consider a small deviation: negligible costs but non-negligible benefit by influencing B's update.

Equilibrium reporting in period 1 - Contradicting

- **Proposition 2**. In any equilibrium, $|\eta_{R1} - \eta^*_{B1}| > |\eta_{R1} - \eta^*_{C1}|$.
- Contradicting & magnification effect. Recall that C expected payment is decreasing in B's self-confidence. C sends a report that contradicts B' information, exaggerating high signals and and downplaying low ones.
- C can back out the true state of the world, which implies full information transmission ($\Rightarrow$ we can apply Lemmas 1 & 2).
- Equilibrium is inefficient due to the cost of misreporting. However, truth-telling would not be incentive-compatible as mimicking is then too cheap.

Extension of the Model

Suppose that C receives a noisy signal about B's signal $\eta_{ct} = \eta^*_{Bt} + \varepsilon_c$, where $\varepsilon_c \sim N(0, \sigma_c^2)$. Main result of C's tendency to contradict is preserved.

- The case of $\sigma_c^2 = 0$ corresponds to the previous analysis.
- The case of $\sigma_c^2 \to \infty$: fully informative equilibrium but new effect: (i) the consulting relationship might stop in period 1; C wants to contradict B but she might make a mistake in guessing η^*_{B1} and jeopardize the agreement.
- In the case of $\sigma_c \in (0, \infty)$, new effects: (i) & (ii) the equilibrium is not fully informative (B cannot filter out all noise from C's report because of η_{ct}) and the updating rule cannot be applied directly.

Conclusion & Discussion 1

- In situations where client experiences "dual learning" (about the current project and about its ability to deal with similar future projects), consultant contradicts (rather than conforms) the client.
- This is in contrast to the "Yes Men" effect (Prendergast 1993) obtained in a similar setup, and also the connected literature on subjective performance evaluation and the "conformism bias" in incentives (Gibbs et al. 2004).

Conclusion & Discussion 2

- In the baseline model, there is biased reporting but full information transmission.
- The consulting relationship continues to period 2 with probability 1. This is consistent with the observation of some consultancies "stretching" engagement with clients and making their involvement seem indispensable.
- This might contribute to explain several cases of consultancies expanding to business projects previously undertaken by their clients, after the consultation takes place and the consultancy strategically keeps the client with low (corporate) "self-confidence".

Related literature

- Subjective Performance Evaluation: Prendergast (1993); Baker et al. (1994); Gibbs et al. (2004):
  In contrast to a "conformism" bias, we find that a dynamic agency generates a "contradicting" bias.
- Dynamic agency models: Prendergast and Stole (1996); Holmstrom (1999); Levy (2005):
  Motivation for misreporting in this literature is due to signaling high ability.
- Information misreporting: Fudenberg and Tirole (1986); Fischer and Verrechia, (2000); Iossa and Jullien (2007):
  Papers do not consider misreporting to influence the confidence of the other party
- Client-consulting relationships: Esö and Szentes (2007), Bergeman et al. (2018):
  Very different focus to our paper, as we study the incentives for misreporting in a dynamic agency with a client of unknown ability.