

Referee Report on
“Bounded Rationality in Keynesian Beauty Contests: A
Lesson for Central Bankers?”
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Summary

The authors review the literature on level-k thinking with a particular focus on recent applications in behavioral macroeconomics. This paper could become a useful guide in light of a growing interest among macroeconomists in this deviation from the rational expectations assumption. I have several comments that can improve the paper.

Comments

1. I think the authors have not re-read the paper after finishing writing it.
 - (a) There are three virtually identical paragraphs found in two different places in the paper (on pages 10 and 15). These paragraphs on page 10 read as follows:

” These two terms were originally shaped by Bulow et al. (1985) and developed for studies of rm interaction but can be applied to any game or situation of strategic interaction between dierent agents. Different names under which these terms are known in the literature but which generally describe the same idea are “negative feedback” (strategic substitutes) and “positive feedback” (strategic complements.) Agents’ decisions are complements if they have an incentive to match other agents’ decisions. Conversely, agents’ decisions are substitutes if agents have an incentive to do the opposite of what others are doing. For instance, if a rm can increase its prot by charging the same price as others, then prices are strategic complements. If firms can make more profit by charging high prices when their competitors charge low prices (or vice versa), then prices are strategic substitutes.

In simple BC games where agents need to be closest to a target of b times the average, whether the system exhibits strategic substitutes or strategic complements

only depends on the coefficient b : If $b > 0$, the system exhibits strategic complements, since if all others increase their choices, an individual also has an incentive to increase her choice. Conversely, if $b < 0$, the system exhibits strategic substitutes, since if all others increase their choices, the individual has an incentive to decrease her choice.”

The paragraphs on page 15 are

“The terms were originally shaped by Bulow et al. (1985) and developed for studies of firm interaction but can be applied to any game or situation of strategic interaction between different agents. Different names under which these terms are known in the literature but which generally describe the same idea are “negative feedback” (strategic substitutes) and “positive feedback” (strategic complements.)

Agents’ decisions are complements if they have an incentive to match other agents’ decisions. Conversely, agents’ decisions are substitutes if agents have an incentive to do the opposite of what others are doing. For instance, if a firm can increase its profit by charging the same price as others, then prices are strategic complements. If firms can make more profit by charging high prices when other their competitors charge low prices (or vice versa), then prices are strategic substitutes.

In simple BC games where agents need to be closest to a target of p times the average, whether the system exhibits strategic substitutes or strategic complements only depends on the coefficient p . If $p > 0$, the system exhibits strategic complements, since if all others increase their choices, an individual also has an incentive to increase her choice. Conversely, if $p < 0$, the system exhibits strategic substitutes, since if all others increase their choices, the individual has an incentive to decrease her choice.”

- (b) The following text does not seem to logically belong to Section 4 (it probably teleported there from Section 3, but I am not sure).

“Figure 6 shows the relative frequency of behavior in such a case. Finally, behavior closely corresponds to the equilibrium with a very small variance, contrasted to figure 4, without signals but also with an open interval. The naive or intuitive choice, “choose your signal” (as an anchor) is chosen by the majority of subjects (see Benhabib et al. (2019)).

When idiosyncratic signals are drawn from a normal distribution with positive mean (say 10), then behavior again is far away from equilibrium when high level-

ks are necessary to reach such an equilibrium. The reason is that human subjects again use their signal or close to it as their choice. As a consequence, average behavior is close to the average signal, 10 in our example. However, $2/3 \times 10 + \text{expected signal (10)}$ is 16.67. Further iterations slowly leads to 30, the average equilibrium of such a game (see also variation 4). Thus, signals have to be chosen wisely (Bühren and Nagel, 2019).

There is of course, one caveat. What do such signals mean in reality, or how can a policy maker choose or distribute such signals. Or are they "constructed" by the agents, under concern, themselves."

- (c) The authors refer to Figure 6. However, there are only four figures in the paper.
2. This is a review paper. I would very much appreciate not just the description of the old and new research but a more critical evaluation of this whole literature: limitations of level-k thinking, alternatives to level-k thinking, potential future directions of research, etc. Let me expand by giving a few examples.
- (a) It is well known that the outcome of level- k thinking depends crucially on level-0 behavior. This has been known for more than 20 years. Are there lessons from behavioral game theory for macroeconomics?
 - (b) While level-k thinking is becoming popular in macroeconomics, it is far from being clear that it is very different from, for example, the dispersed information assumption (Angeletos and Lian, 2016; Angeletos and Huo, 2018). It would be very informative if the authors discussed the pros and cons of these approaches in detail. Why should macroeconomists prefer level-k thinking over the dispersed information assumption?
 - (c) Level-k thinking has a lot of support in lab experiments. However, it is far from obvious that people outside of lab experiments behave in a similar way. I think there is a huge unanswered question of whether there is any evidence of level-k thinking in macro settings. One problem is that there is almost no data on higher-order beliefs in macro settings (Coibion, Gorodnichenko, Kumar, and Ryngaert, 2018 is one exception). I think a discussion along these lines can be very illuminating.

References

- ANGELETOS, G.-M., AND Z. HUO (2018): “Myopia and Anchoring,” Discussion paper, National Bureau of Economic Research.
- ANGELETOS, G.-M., AND C. LIAN (2016): “Incomplete information in macroeconomics: Accommodating frictions in coordination,” in *Handbook of Macroeconomics*, vol. 2, pp. 1065–1240. Elsevier.
- COIBION, O., Y. GORODNICHENKO, S. KUMAR, AND J. RYNGAERT (2018): “Do You Know That I Know That You Know...? Higher-Order Beliefs in Survey Data,” Discussion paper, National Bureau of Economic Research.