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Journal of Economic Theory 173 (2018) 56–94

JOURNAL OF Economic Theory

www.elsevier.com/locate/jet

Foundations for optimal inattention

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Received 4 May 2016; final version received 26 September 2017; accepted 16 October 2017
Available online 23 October 2017

Abstract

This paper models an agent who has a limited capacity to pay attention to information and thus conditions her actions on a coarsening of the available information. An optimally inattentive agent chooses both her coarsening and her actions by maximization of an underlying subjective expected utility preference relation, net of a cognitive cost of attention. The main result axiomatically characterizes the conditional choices of actions by an agent that are necessary and sufficient for her behavior to be seen *as if* it is the result of optimal inattention. Observing these choices permits unique identification of the agent's utility index, the information to which she pays attention, her attention cost and her prior whenever information is costly.

JEL classification: D01; D81; D83

Keywords: Inattention; Optimal inattention; Conditional choice

1. Introduction

Individuals often appear not to pay attention to all available information. As argued by Simon (1971), "a wealth of information creates a poverty of attention, and a need to allocate that

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[1] I am especially grateful to Larry Epstein, Bart Lipman and Jawwad Noor for their advice, support and guidance. I would also like to thank the editor, the referees, Laurent Bouton, Andrew Caplin, Sambuddha Ghosh, Faruk Gul, Sean Horan, Asen Kochov, Gilat Levy, Albert Ma, Francesco Nava, Andy Newman, Efe Ok, Pietro Ortoleva, Collin Raymond, Ronny Razin, Dana Rotz, Todd Sarver, Jeremy Smith, Tomasz Strazlecki, Balazs Szentes, and conference/seminar participants at RUD 2012, NASM 2012, NSF/NBER/CEME CGEME 2012, BRIC 2013, NYU, LSE, Michigan, Kellogg MEDS, Penn State, Duke, Johns Hopkins, Warwick, Oxford, and Rochester for helpful conversations and comments.

https://doi.org/10.1016/j.jet.2017.10.004
0022-0531/

attention efficiently."[2] This has motivated the application of models incorporating limited attention to economic settings, where it is found that inattention has significant consequences.[3]

This paper develops an axiomatic model of an agent who responds optimally to her limited attention, with the aim of clarifying its implications for observable choice behavior and providing a choice-theoretic justification for it. An *optimally inattentive* agent associates a cost of paying attention to each information partition, and she chooses both her partition and her actions conditional on it by maximizing expected utility net of this cost. I axiomatically characterize the conditional choices of actions by a decision maker (DM) that are necessary and sufficient for her behavior to be seen *as if* it results from optimal inattention.

I take as primitive an objective state space and a rich set of choice data, namely the DM's choices from each feasible set of acts and conditional on each state of the world.[4] I propose six natural properties of these choices, each of which weakens or is equivalent to one of the axioms that characterize a fully attentive, subjective expected utility DM. The key axiom, *Independence of Never Relevant Acts (INRA)*, requires that if two choice problems differ only because the second lacks an act that the DM *never* chooses when she faces the first, then she makes the same choices from each of the problems. The main theoretical results (Theorems 1 and 2) show that these axioms characterize a DM who pays attention to a partition Q that maximizes

$$\sum_{E\in Q}\pi(E)\max_{f\in B}\int u\circ f\,d\pi(\cdot|E)-\gamma(Q)$$

when she faces the choice problem B, where u is a utility index, π is a probability measure, and γ is an attention cost function.

The range of behavior studied permits identification of the DM's tastes, beliefs, and attention costs, as well as the information to which she pays attention (which I call her *subjective information*). The challenge for identification stems from the modeler's inability to observe subjective information directly. This causes the DM to violate many of the properties that permit identification in other models, including the Weak Axiom of Revealed Preference (WARP). Nevertheless, I show that the DM's subjective information can be inferred from her choice behavior. Building on this insight, Theorem 3 shows that u, π, γ, and the agent's subjective information are all uniquely identified from choice data alone, whenever the likelihoods of all events are decision-relevant.

My analysis also distinguishes two special cases that have been studied in applied settings but are observationally equivalent within any fixed choice problem. A DM has a *fixed attention representation* if she always pays attention to the same information, regardless of the problem faced. A DM has a *constrained attention representation* if she has a constraint that limits the information to which she can pay attention, and she chooses her coarsening optimally within this constraint. Corollaries 1 and 2 characterize the three models in terms of the permitted violations of the Independence Axiom. Specifically, the fixed attention model never violates the Indepen-

[2] Economists have also empirically documented that agents, e.g. restaurant patrons (Luca, 2011), stock traders (DellaVigna and Pollet, 2009) and professional forecasters (Coibion and Gorodnichenko, 2012, 2015), fail to process all available information. Psychologists have also documented inattention, e.g. Pashler (1998)'s book-length treatment.

[3] For instance, it can imply delayed response to shocks (Sims, 1998, 2003), sticky prices (Mackowiak and Wiederholt, 2009), under-diversification (Van Nieuweburgh and Veldkamp, 2010), sticky investment (Woodford, 2008), coordination failure (Hellwig and Veldkamp, 2009), specialization (Dow, 1991), self-reinforcing career dynamics (Meyer, 1991), exploitation (Rubinstein, 1993), and extreme price swings (Gul et al., 2017).

[4] This data is typically used in dynamic decision-theoretic models and extends that considered by the papers cited in Footnote 3; Sections 2.3 and 6 elaborate further.