On Psychology, Economics, and the Prediction of Human Behavior (Beyond counter examples)

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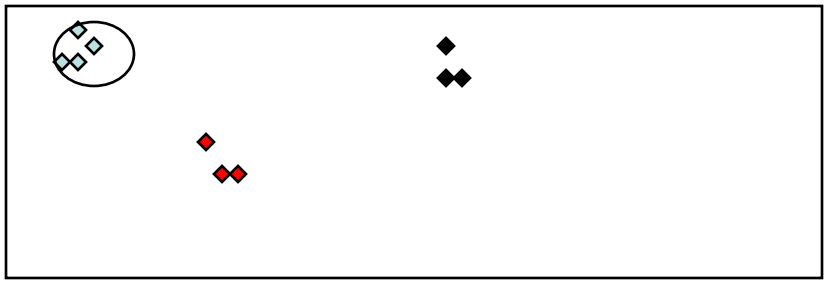
The main differences between basic research in psychology and economics involve the relative importance of **accuracy** and **generality**. Psychologists tend to focus on **accuracy**. A good model is the best summary of the data presented in the relevant paper.



Economists pay more attention to **generality**.

Al Roth's "**1-800 critique**", and the "**history critique**" helped me understand the value of the economists' point of view.

However, accuracy is important too.

Basic research in behavioral economic tries to facilitate generality and accuracy by focusing on **deviations from the predictions of rational decision theory.**

"If we could understand how people deviate from this general theory, we could develop a general descriptive model."

The most influential studies focus on the Allais paradox and the prisoner dilemma game:

The Allais/ certainty effect (from K&T, 1979, following Allais, 1953)

Problem 1:
S: 3000 with certainty
R: 4000 with p =0.80; 0 otherwise

Problem 2:
S: 3000 with p =0.25; 0 otherwise
R: 4000 with p =0.20; 0 otherwise

The prisoner dilemma game

	Co-op	Defect
Co-op	1, 1	-1, 2
Defect	2, -1	0, 0

This solution sounds logical, and it has led to important insights, but it has two significant shortcomings:

1. Counter-to-counter-examples. Recent research suggests that the behavioral regularities documented in the popular experimental paradigms are not general. Very different regularities are observed in other paradigms.

2. Narrow benchmark. The fact that the rationality assumption is general does not imply that it can lead to clear predictions. Additional assumptions are typically needed.

The main goal of the current paper is to clarify these shortcomings, and discuss one idea that can be used to address the 1-800 and history critiques.

Counterexamples and counter-to-counterexamples in individual choice

The Allais/ certainty effect (from K&T, 1979, following Allais, 1953)

Problem 1:

S: 3000 with certainty

R: 4000 with p =0.80; 0 otherwise

Problem 2:

S: 3000 with p =0.25; 0 otherwise

R: 4000 with p =0.20; 0 otherwise

Buying lotteries and insurance

Problem 3:

S: 0 with certainty

R: 10 with p =0.1; -1 otherwise

Problem 4:

S: 0 with certainty

R: -10 with p =0.1; 1 otherwise

Oversensitivity to rare events

Counterexamples and counter-to-counterexamples in individual choice

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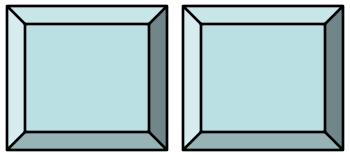
Oversensitivity to rare events

The reversed Allais/ certainty effect (from Barron & Erev, 2003)



Problem 1r:

S: 3 with certainty

R: 4 with p =0.80; 0 otherwise

Problem 2r:

S: 3 with p =0.25; 0 otherwise

R: 4 with p =0.20; 0 otherwise

"It wont happen to me" (from Nevo & Erev, 2010)

Problem 3r:

S: 0 with certainty

R: 10 with p =0.1; -1 otherwise

Problem 4r:

S: 0 with certainty

R: -10 with p =0.1; 1 otherwise

Under-sensitivity to rare events

This description-experience gap is not an isolated example. It seems that the different information triggers different processes.

The tendency to **overweight rare events when they described** appears to reflect a mere presentation effect.

The tendency to **underweight rare events in decisions from experience** can be captured with the reasonable assumption that people tend to relay on a small sample of experiences in similar situations (see related ideas in Gilboa & Schmeidler, 1995 Kareev, 2000; Osborne and Rubinstein, 1998; Lebiere et al., 2007; Hertwig et al., 2004).

Narrow benchmark

It is important to emphasize that the “clicking paradigm” cannot be used to reject the rationality assumption.

Almost any behavior can be justify as “rational” given certain beliefs in this setting.

We believe that this observation is not a shortcoming of the clicking paradigm and/or the study of decisions from experience.

Rather, it demonstrates the limitation of the rationality assumption, and the value of advancing beyond this assumption and its violations.

The clicking paradigm is not unique. Even the choice to live in Israel can be justified as rational under certain beliefs and/or utility functions.

Counterexamples and counter-to-counterexamples in social interactions

Mainstream behavioral game theoretic research demonstrates robust deviations the predictions of "high rationality" game theory. The best known class of deviations can be summarized with models that assume **other regarding preferences** (see Fehr & Schmidt, 1999; Bolton & Ockenfels, 2000; Rabin & Charness, 2002).

	Co-op	Defect
Co-op	1, 1	-1, 2
Defect	2, -1	0, 0

However, analyses of natural conflicts appear to lead to the opposite conclusion. For example, leading negotiation textbook suggest that people exhibit a **"mythical fixed pie"** bias (see Bazerman, 2006): They do not think enough about the incentives of the other side; they behave as if they assume that the world is a constant sum game.

We believe that the coexistence of "**other regarding preferences**" and the "**mythical fixed pie beliefs**" is another indication for the **description-experience gap discussed above**.

The following 5-alternative Stag Hunt game clarifies this assertion

	S	B1	B2	B3	E
S	10, 5	9, 0	9, 0	9, 0	9, 0
B1	0, 4	0, 0	0, 0	0, 0	0, 0
B2	0, 4	0, 0	0, 0	0, 0	0, 0
B3	0, 4	0, 0	0, 0	0, 0	0, 0
E	0, 4	0, 0	0, 0	0, 0	12, 12

Sensitivity to the payoffs of other agents will drive choice behavior to the fair and efficient outcome (E, E) in decisions from description. And, unless the players explore enough, they are likely to converge to the inefficient and unfair equilibrium in decisions from experience.

Optimistic implications and the value of Emphasis Change training

The results suggest that the focus on counterexamples does not solve the 1-800 critique.

Indeed, we need two 1-800 numbers. One in the rationality center (to address the narrow benchmark problem), and one for the deviations center (to ask which of the different deviations is more likely).

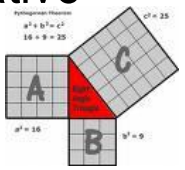
Moreover, if deviations are observed, the implied model does not address the history critique.

The quantification solution

One solution to the 1-800 critique calls for a focus on quantitative models. We believe that there are two main reasons for the limited usage of this solution:

First, it seems natural to assume that we should understand the relevant phenomena before we start fitting parameters.

This assumptions is reasonable, but it is not always correct. In many cases useful models triggered theoretical insights. For example, the quantitative rule behind Pythagorean theorem was known 1300 before Pythagoras.



Second, the attempt to develop quantitative models tend to be less reinforcing than research that focuses on an elegant counterexample. This state can be the product of the fact that the effect quantitative models is a long shot. Thus, the tendency to avoid quantitative models can be an indication of reliance on small samples of experiences.

We believe that this problem can be addressed with the organization of choice prediction competitions.

Erev et al. (2010) explore the value of this approach (see http://tx.technion.ac.il/~erev/Comp/Comp.html)

We organized three competitions that focus on choices of the type:

S: *Med* with certainty
R: *High* with probability *Ph*; *Low* otherwise

The payoffs are in Sheqels drawn from the range (-30 and +30)
The probability is drawn from .01,-.1; .11-.89; .9-1

Each competition focus on a distinct experimental condition. The conditions include:

1. Description: One-shot decisions under risk (like Kahneman & Tversky, 1979)
2. Feedback: Repeated decisions from experience (as in Barron & Erev, 2003)
3. Sampling: One-shot decisions from experience (as in Hertwig et al., 2004)

We ran a large "estimation study" with randomly selected problems in each of these conditions.

The data were presented on the web. The basic task in the competition was to predict choice behavior in a second study, the "competition study," that examined a different set of problems randomly selected from the same population of problems). The ranking criterion was squared error.

24 submissions. The results clarify the generality of the description-experience gap and the vividness explanation of this gap.

The best model in the description condition (the winner is Haruvy) was a stochastic variant of CPT, and the best models in the two experience condition (the winners are Herzog et al., and Stewart et al.) assume reliance on small sample of experiences in similar situations.

One indication of the potential value of the current approach is the large advantage of sampling models over reinforcement learning models.

The best sampling model simply states:

WV(R) = .7(mean of sample of 5 in a similar setting) + .3(Grand mean)

In contrast, reinforcement learning model assumes sequential adaptation of propensities without memory of specific instances.

The recent popularity of reinforcement learning models comes from 3 observations:

(1) They imply convergence to rational choice (Sutton & Barto, 1998).
(2) Correlation (of the assumed computation with the activity of the dopamine neurons (Schultz, 1998).
(3) Good predictive value (Erev & Roth, 1998)

The current analysis questions the significance of these observations.

We plan to extend the choice prediction competition effort.

One of the next competitions will focus on a set of 4-person market entry games.

Each player is ask to select between:

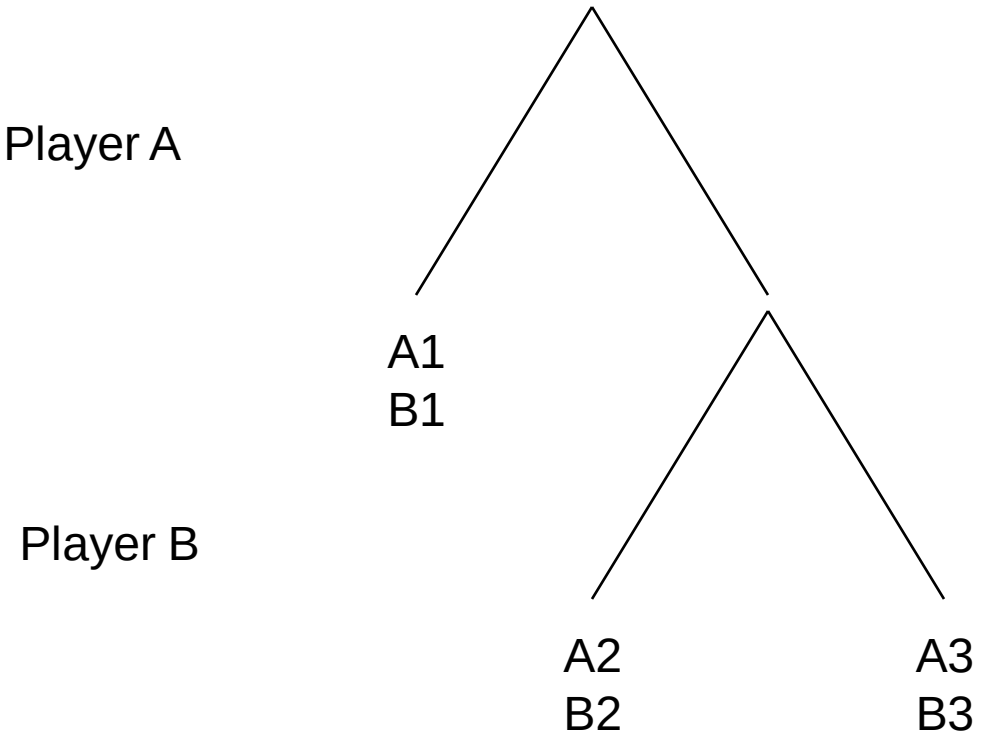
Entering a risky market
A Safer alternative

The payoff from entering is 10 – K*(number of other entrants) + Gt

Where Gt is a realization of a gamble at trial t

Complete feedback after each trial.

Another copetition



Summary

The 1-800 and the history critiques of basic psychological research are important

Yet, it is not clear that the methods currently used in economics address these critiques.

To address the 1-800 critique it is necessary to clarify the conditions that trigger the different tendencies and allow useful predictions. The prediction competitions are designed to facilitate research that address this important goal.

The study of decisions from experience has the attractive features:

- The results appear to be robust (e.g., common to human and lower animals)
- It expands the set of situations that can be addressed.
- It implies a "near equilibrium" answer to the history critique.