Jean-Robert Tyran
Department of Economics,
University of Copenhagen

Suggested Answers in Final exam for MA course "Behavioral and Experimental Economics"

August 26, 2019 (2 hours, closed book)

Question 1: Loss aversion

Loss aversion (Kahneman and Tversky ECMA 1979) is a key concept of behavioral economics. It can potentially explain important phenomena which cannot easily be accounted for by standard economics.

a) Loss aversion can be used to set incentives to reach particular policy goals more effectively. An example is Fryer, Levitt, List and Sadoff (NBER WP 2012) whose goal it was to improve schooling outcomes.

Briefly explain the basic design, the main finding, and how it relates to loss aversion.

A: The authors present a field experiment with teachers in schools with many disprivileged children in Chicago heights. Teachers are randomly assigned to one of two treatments. In one treatment ("gains"), they promise teachers end-of-year-bonus according to improvement in test scores of their pupils (in expectation $4000) in the other treatment ("losses"), they give teachers $4000 upfront and make them repay the difference if improvement in scores is below average. Hypothesis: the loss treatment creates stronger incentives for teachers to improve scores. Finding: large gains in pupils' math test scores with loss framing, no impact of teacher incentives when framed as gains. Relevance: Making upfront payment is an effective way to increase pupils' educational achievements which are highly relevant for (labor market) outcomes later in life.

b) What other phenomena can loss aversion account for? Name **one** example of research discussed during the course to illustrate. For the example you choose, describe the setting we discussed (survey study, lab or field experiment) in sufficient detail (in similar detail as discussed in the slides), explain what role loss aversion plays in the setting, and discuss the potential relevance of the finding for economic theory or policy.

A: Below, I provide just some examples with short descriptions. Other examples may be admissible. To obtain the full number of points, students need to describe the setting in similar detail as in the lecture notes or assignments.

1. Increasing pension savings: Thaler and Benartzi's (JPE 2004) "Save more tomorrow" (SMarT) scheme has increased savings in defined-contributions plans for two reasons. First, employees commit to save part of future wage increase (uses loss aversion: you still get a raise, but it is lower than it could have been whereas workers see it as a loss if they have to contribute of current income). The scheme works best (i.e., has most acceptance) when this is made the default option. That is, employers offer SMarT as a default which is implemented if employees take no particular action but employees can "opt out" of the scheme if they like. (Using defaults is a standard example of nudging)

2. Nominal inertia: Fehr and Tyran (AER 2001) find an asymmetry in nominal inertia after positive and negative monetary shocks in a lab experiment which shows payoffs in nominal terms. After a negative shock, prices must fall and subjects have to move from

high to low nominal payoffs in the table. If subjects are prone to nominal loss aversion, they will be reluctant to do so. With a positive shock it is the reverse. Relevance: explains asymmetric real effect of monetary expansion vs. contraction.

3. The endowment effect means that people value objects they own more highly than objects they do not own. Example: Classroom experiment with decorated mugs. Willingness to pay for a mug was only about half as high as the willingness to accept money to return a mug. Relevance: Coase theorem breaks down (which assumes WTP = WTA) which is important for various policies suggested in environmental economics.

4. Downward nominal wage rigidity. Workers resist real wage cuts more when they come with nominal wage cuts (because they are salient) than when they come with nominal wage increases. Example: Survey study by Agell and Bennmarker (2003) with Swedish human resource managers finds managers think workers will resist a real wage cut more when it comes with a nominal cut. Relevance: targeting positive inflation rates by central banks can be justified by nominal wage rigidity. Positive inflation rates facilitate structural adjustment to regional or sectoral shocks.

5. "Asian disease problem" (Kahneman and Tversky, 1981 Science). Example of first-wave (survey) research. Two scenarios which differ whether the consequences of programs to combat an Asian disease are presented in terms of lives saved ("gains") or of people dying ("losses"). In each scenario, there is a safe but on average unattractive option and a risky but on average more attractive option. Finding: respondents favor the safe option with gains framing but the risky option in the loss frame. That is, popularity of a given program strongly depends on how it is presented. Relevance: policy choices may be influenced by their presentation.

6. Myopic loss aversion (MLA). We discussed various studies on MLA. Example: Lab experiment by Gneezy and Potters (QJE 1997): If a risky asset similar to a stock (paying a an uncertain dividend) is frequently evaluated, people are less likely to hold the asset than if evaluated infrequently. Investors seem to shy away from making on average profitable investments because of the possibility of losses (the risk of a loss falls with longer horizons). Implication: people do not take enough risk which would be profitable in the long run. Relevance: might explain low participation rate in the stock market.

7. Andersson, Holm, Tyran and Wengström (Management Science, 2016) show that deciding for others reduces loss aversion in a large sample of the Danish population. Use multiple price list technique with price lists that do or do not involve losses. Relevance: loss aversion is likely to be an emotional response to fear rather than a deep preference.

8. (only briefly discussed): Myopic loss aversion has been invoked to explain the "equity premium puzzle" (Benartzi and Thaler QJE 1995). Relevance: large premium for holding stocks over bonds cannot be explained by invoking risk aversion, would require implausibly high values.

9. (only briefly discussed): Odean (JoF 1998) shows that investors are more reluctant to sell stocks at a loss than at a gain (disposition effect). Effect: investors tend to keep losers in their portfolio and sell the winners. Relevance: lower returns.

Question 2: Biases in probability estimates

a) Friedman (AER 1998) observes that subjects do not "switch" as often as predicted by standard economic theory in the standard Monty Hall Game in which subjects pick one of three doors containing a prize.

Name **two** treatment variations that can mitigate the "anomaly" and explain why these manipulations are expected to be behaviorally effective.

A: Ways to mitigate: i) use many doors rather than only 3. The reason is that with 3 doors, the strategies "remain" and "switch" have relatively similar payoffs (1/3 and 2/3) which means that the difference is hard to learn for someone who holds the prior that it is 50%. With 10 doors, say, the contrast gets much stronger (1/10 vs. 9/10). ii) Another option is to let a different subject (or the computer) choose the first door. Subjects don't feel commited to their first choice, an anticipated "regret" from switching and not winning is reduced.
Options discussed in Friedman are "track record" (show counterfactual success rates) which is supposed to facilitate statistical learning, intense incentives (pay more for finding the price) which is supposed to induce added cognitive effort, "advice" (subjects may not be able to formulate the correct solution but are supposed to recognize it when it is presented to them) the "compare" (learn from experience of others). But none of these has strong effects. Slembeck and Tyran (JEBO 2004) look at simple institutions like (rank order) competition (supposed to elicit more cognitive effort and allows for learning from others) and communication (learning from others, "wisdom of the crowds"). Jointly, these institutions are very successful.

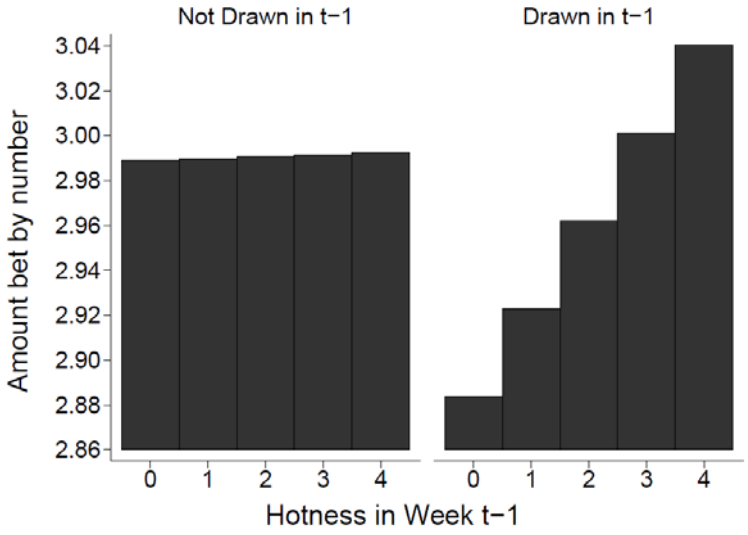
b) A "Hot hand fallacy" (HHF) has been claimed to be present in Basketball (Gilovich, Vallone and Tversky 1985). The evidence was later contested.
What is the HHF? Why is it difficult to test for the HHF in a sport like basketball?

A: The HHF results from a belief in positive autocorrelation. HH is a behavioral tendency to "overinfer" or "overextrapolate" a trend. In basketball it means that a player who has scored several 3-point shots in a row is more likely to score at the next attempt than a player who did not have a streak. It is difficult to pin down HHF in interactive sports because players change their behavior in response to a player scoring repeatedly. For example, the competing team may attack a "hot" player earlier (or the «hot» player may attempt more difficult shots) etc.

c) Croson and Sundali (JRU 2005) provide evidence for the "Gambler's fallacy". Explain the basic intuition of the fallacy. What is the authors' main finding?
A: The GF results from the "law of small numbers" (Tversky and Kahneman 1971) and is a belief in quick reversal if a deviation from expected proportions is observed in a series of random events (false belief in negative autocorrelation).
The authors study data (in particular the "outside bets", i.e. "Red" vs. "Black") from cameras mounted above roulette tables in a Casino. They fin d that if a sufficiently long streak of "Red" occurs, gamblers increasingly bet on "Black", consistent with GF.

d) Suetens, Jørgensen and Tyran (JEEA 2016) study the Gambler's fallacy (GF) and the Hot-Hand fallacy (HHF) using Lotto data in Denmark. The figure below presents their estimates for how much "changers" bet. Explain how the Gambler's fallacy and the Hot-Hand fallacy can be read off the figure

A: the GF-effect is seen most clearly by comparing bars at "hotness" 0: the average lotto player ("changer") bets about 0.1 DKK (i.e. 3.5%) less on a number when it has been drawn than when not. The HHF-effect for numbers drawn (right panel): when the number has been drawn 4 times they bet 0.16 DKK (5.5%) more than when it has never been drawn.



Question 3: Individual irrationality and aggregate outcomes

a) Provide a definition of bounded rationality.
Hint: Refer to the definition of rationality in Camerer and Fehr (Science 2006)

A: "The rationality assumption consists of two components: first, individuals are assumed to form, on average, correct beliefs about events in their environment and about other people's behavior; second, given their beliefs, individuals choose those actions that best satisfy their preferences. If individuals exhibit, however, systematically biased beliefs about external events or other people's behavior or if they systematically deviate from the action that best satisfies their preferences, we speak of bounded rationality."

b) Consider a "guessing game" in which $N > 2$ players choose a number [0, 100]. The player closest to a target $T = pM$ wins a prize, where M is the average number chosen by all players and $0 < p < 1$. If several players are equidistant to T, the prize is shared among these players.
Assume a share $0 < s < 1$ of players is boundedly rational in the sense that they choose the best reply to a belief $b > 0$ about what everyone else chooses, while the remaining players are fully rational in the sense that they play a best reply r to what everyone chooses.

b1) In what ways is the share s of players boundedly rational? Explain with reference to the definition you gave in a) above.

A: These players do not "form, on average, correct beliefs … about other people's behavior" but they do "choose those actions that best satisfy their preferences", "given their beliefs"

b2) What belief B^* do the fully rational players hold in equilibrium if $0 < s < 1$? Provide a formal expression.

A: Fully rational players choose a best reply r to what everyone does, i.e. to the average choice $M = (1\text{-}s)r + sa$. In contrast, the choice a of the boundedly rational players is a best reply to their exogenous belief b, $a = pb$. That is, the fully rational players choose $r = pM$. Solving for r yields the equilibrium choice $r^* = psa\,/[1\text{-}p(1\text{-}s)]$, and the (equilibrium) belief of the fully rational players is $B^* = r^*/p = M^*$, i.e. $B^* = sa\,/[1\text{-}p(1\text{-}s)] = spb\,/[1\text{-}p(1\text{-}s)]$.

b3) How does an increase in the share of irrational players *s* shape the deviation of aggregate outcomes from the standard prediction in the game above? Is the change proportional to the change in *s*? Why (not)? *Hint*: refer to direct vs. indirect effects

A: An increase in the share of irrational players *s* increases the deviation from the standard prediction (the standard prediction is that everyone chooses zero when $s = 0$) for two reasons. First because of a direct effect: there are more irrational and fewer fully rational players. This effect is proportional to the share *s*. Second, because of an indirect effect: rational players partly imitate the irrational players with strategic complementarity. The indirect effect adds to the direct effect when $0 < p < 1$. Therefore, the increase is more than proportional.

c) Cooper, Schneider and Waldman (GEB 2017) use a guessing game with $T = pM + d$.

c1) The authors study shocks in two treatments that differ with respect to *d* and *p*. How are these parameters set, what hypothesis do they test, and do the results support the hypothesis?

A. They are set to compare price adjustment with strategic complements ($p > 0$) to strategic substitutes ($p < 0$) while holding the equilibrium constant. In particular, Pre-shock equilibrium at 60 with complements: $p = 0.75$, b = 15, substitutes: $p = -0.75$, $d = 105$. They implement a shock to a obtain a Post-shock equilibrium at 14 with $p = 0.75$, $d = 3.5$, substitutes: $p = -0.75$, $d = 24.5$. The hypothesis is faster adjustment with strategic substitutes than complements which is supported by the data (slight overshooting with substitutes, inertial adjustment with complements).

c2) How do the findings of Cooper et al. (GEB 2017) relate to Fehr and Tyran (ECMA 2008)? (*Hint*: these authors study the effect of strategic incentives on nominal inertia)

A: There are many similarities (Cooper et al follow up on and corroborate the results FT). FT implement a negative nominal shock in two treatments which differ only by strategic properties (strategic complements vs. substitutes), similar to Cooper et al. However, they present the payoffs to subjects in payoff tables showing nominal payoffs (to induce sticky expectations after a downward shock). Interestingly, the results are very similar, indicating that strategic complements vs. substitutes has some potential to explain not only nominal inertia (FT implement a purely nominal shock in a money-neutral environment) but also after other types of (real) shocks.

Question 4: Social Preferences

a) Franzen and Pointner (ExEc 2012) use the "misdirected letter technique" to study the "generalizability" of standard laboratory findings in the dictator game. What do they find?

A: They find a significant correlation between dictator giving in the lab and the tendency to return a misdirected letter containing money (in the latter case, participants did not know that they were participating in an experiment).

b) Cappelen, Nielsen, Sørensen, Tungodden and Tyran (Ecs Letters 2013) replicate a study by List (JPE 2007) that challenges the view that giving in the dictator game is a good measure of preferences for altruism or generosity. Describe the design and the main finding of Cappelen et al. (2013)

A: Dictator (= player A) is «tentatively» allocated 200 kr., other 100 kr. In GIVE: Dictator can send from 0 to 100 kr. to other player. In TAKE: as in Give but can also take 0 to 100

kr. So, if A sends 50 kr., they both end up with 150 kr. which is "fair". But: self interest: take 100 kr. (i.e. A gets everything, B nothing). Main result: the share of positive giving falls about by half (from 74% to 34%), and the median transfer falls to 0 in TAKE (from 30 in GIVE). Interpretation: the drop in positive share of giving is not compatible with pure generosity as a motive for DG giving in the standard DG game but is consistent with «manners». What is appropriate to give is to some extent determined by contextual cues.

c) Prasnikar and Roth (QJE 1992) study the multi-proposer Ultimatum game. Describe the game and the main finding.

A: Design: 9 proposers simultaneously submit offers from 0$ to 10$ to a single responder. The responder may exclusively accept the best offer s_h. If he rejects, all 10 players get a payoff of 0. If he accepts, the responder gets s_h, the one proposer who submitted the best (accepted) offer gets 10 - s_h. All others get 0.
Results: Highly unequal outcomes prevail immediately and perfect equilibration prevails after a few periods, as predicted by standard game theory (proposers engage in intense competition and the entire rent goes to the responder).

d) Cappelen, Moene, Sørensen, and Tungodden (JEEA 2013) conduct an experiment to evaluate the role of entitlements and needs in fair sharing. The authors propose a model of how self-interest is traded off against fairness motives:

$$V^k(y;\cdot) = y - \beta(y - m^e)^2/2X - \delta\alpha(y - m^n)^2/2X$$

In which m^e can take three forms. Characterize these forms by using the following expressions: a_i (production of player i), p_i ("price"), X (total income available for distribution)

A: m^E stands for "egalitarian" (share the total income 50:50, no matter what), m^M stands for "meritocratic" (share in proportion to individual production), and m^L stands for "libertarian" (share according to value of production)

$$m^E = X/2,$$

$$m^M = \frac{a_i}{a_i + a_j} X,$$

$$m^L = p_i a_i,$$

Question 5: Discrimination

a) Bertrand and Mullainathan (AER 2004) is an example of a "correspondence test" to investigate ethnic discrimination.

a1) Briefly describe the experiment.

A: Send about 5000 fictitious job applications ("resumes") to employers in response to help-wanted ads in Chicago and Boston newspapers. Randomly assign "White-sounding" names (e.g. Emily Walsh) to half the resumes and "African-American-sounding" names (e.g. Lakisha Washington) to the other half.

a2) What is the main finding of the study?

A: Measure of discrimination: callback rate. There is discrimination. For an identical CV, applicants with “White-sounding” names need to send about 10 resumes to get one callback whereas applicants with African-American names need to send about 15 resumes.

b) Hedegaard and Tyran (JEEA 2018) develop a new type of field study to investigate ethnic discrimination in Denmark.

b1) Describe the general setup of the experiment and how the “price of prejudice” is varied in treatments Info?

A: In all treatments recruit juveniles in Copenhagen to prepare letters for a mailing in two rounds (two consecutive weeks). Half of them have muslim-sounding names, the other half Danish-sounding. They first work individually. They are then called on the phone to invite them for the second round. Respondents get a choice whom to work with and share total work proceeds between two candidates of different productivity (i.e. they have an incentive to pick the more productive one). In treatment Info, the respondent learns both the productivity (how many letters packed last week) and the name. Because the candidates have different productivity, the authors can estimate how much respondents are willing to pay to be with a co-worker of the same type.

b2) Describe the main results of treatment Info. Is discrimination found to be responsive to price changes?

A: 38% of responders discriminate (choose the less productive of the same type), and give up on average 8% of their earnings. No difference between ethnic types. But discrimination is remarkably responsive to price changes (elasticity -0.9)

b3) Which concern with the interpretation of the result in Info does treatment NoName address? What is the finding?

A: Since the choice between the two candidates is framed as a choice of days, it could be that what is measured is not a preference for an ethnic type but for a weekday to work on. Treatent NoName is the same as Info, except that decision makers do not the names of the respondents. The treatment rules out (taste or statistical) discrimination as a motivation for choice. But choosing the less productive candidate is consistent with a day preference. Finding: 92% of decision makers choose the more productive worker (i.e. no evidence for a day preference).