1. Say that there are three alternatives, x, y, and z. You observe a few of a decision maker's choices. In the following examples, (i) are the choices that you see consistent or inconsistent with the IIA assumption, and (ii) can we say whether or not the DM has a rational preference relation over x, y, and z? Explain your answers.

   a) Decision maker 1: $c(x, y) = \{x\}$, $c(x, z) = \{z\}$, $c(x, y, z) = \{x\}$

   This set of choices is not consistent with IIA. The DM chose x from the set of x, y, z but from the set x, z, a subset that includes x, the DM did not choose x. In other words, when the unchosen element y was removed the DM's choice changed from x to z.

   We know that the DM does not have a rational preference relation over these three alternatives. It cannot be that x yields higher utility than z (as implied by the first choice) and that z yields higher utility than x (as implied by the second choice). (Note, of course, that the choice from menus model that we studied in topic 2 is designed to account for exactly that possibility!)

   b) Decision maker 2: $c(x, y) = \{x\}$, $c(x, z) = \{x\}$, $c(y, z) = \{y\}$, $c(x, y, z) = \{x\}$

   This set of choices is consistent with IIA. When an unchosen element is removed from the alternatives, the DM's choice is the same.

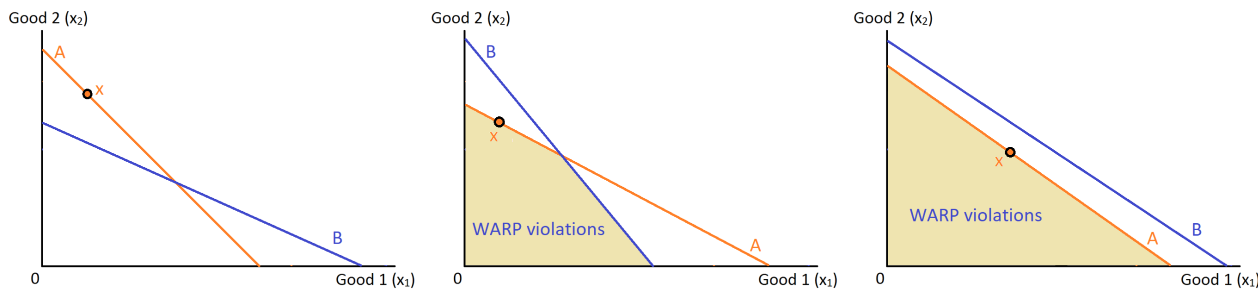
   In this case we do have enough information to say that this DM has a rational preference relation over these three alternatives. We know their choice for each possible choice set and there are no violations of IIA.

   c) Decision maker 3: $c(x, y) = \{y\}$, $c(x, z) = \{x\}$, $c(y, z) = \{y\}$

   This set of choices is consistent with IIA. We don't have any data on choices from some set of alternatives and choices from a subset of those alternatives, so the IIA condition is trivially satisfied since its 'if' condition is not observed.

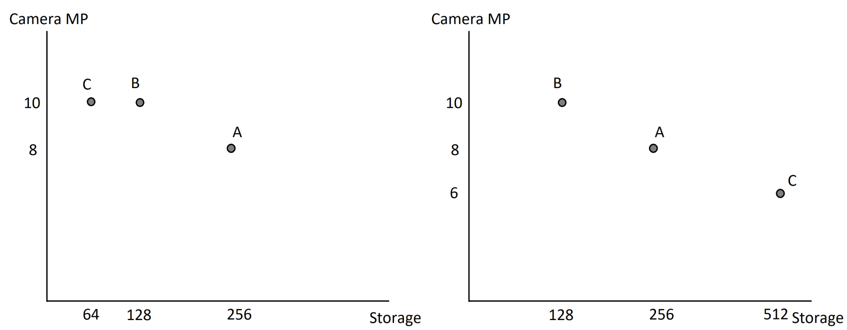
   In this case we cannot say whether this DM has a rational preference relation over these three alternatives. If we saw $c(x, y, z) = \{x\}$ we would be able to say one way or the other—for example if $c(x, y, z) = \{y\}$ we would have a full set of choice data and no IIA violations.

2. In each of the three situations depicted below, say that you have observed the decision maker face the budget set bounded by line A and that they chose $c(A)$. If you also observed their choice from the budget set bounded by line B, what choices from that budget would be consistent with WARP and what choices would violate WARP? Be as specific as possible, and explain your answers. [You can answer in words or by reproducing the diagrams to indicate the relevant areas. For simplicity, assume that $c(A)$ is not in the DM's choice set from budget B.]



In the first case, any choice from the blue budget is consistent with WARP since the choice from the orange budget is not in the blue budget at all—since x is not available the condition is trivially satisfied. In each of the second picture I've shaded parts of the blue budget set that, if we observed them chosen, would represent violations of WARP. In each case, the DM reveals by choosing x that they prefer it to any other point in the orange budget. So we cannot see any of those points chosen from the blue budget when x is not.

3. You work for a company that produces two smartphone models. Model A has 256GB of storage and an 8 megapixel camera; model B has 128GB of storage and a 10 megapixel camera. At the moment sales of the two models are roughly equal.



a) Say that you are asked by your boss to boost sales of model B. Suggest attributes for a new model C that would achieve this goal by harnessing the attraction effect. Explain your answer and illustrate with a diagram.

I suggested 64GB storage and 10MP camera. This is definitely inferior to model B, and so by the attraction effect may increase sales of model B by giving consumers a clear reason to choose model B over A.

b) Say that you are asked by your boss to boost sales of model A. Suggest attributes for a new model C that would achieve this goal by harnessing the compromise effect. Explain your answer and illustrate with a diagram.

I suggested 512GB storage and 6MP camera. This is makes model A 'in between' B and C, and so by the compromise effect may increase sales of model A by giving consumers a clear reason to choose model A over B.

4. **a)** Jim is at a party and there is cake. He likes cake but doesn't want to look greedy, so he takes the slice of cake that is closest to the average size among all the available slices. Is this procedure in general consistent with IIA? Either explain why it is or give and explain a counterexample.

   This is not consistent with IIA in general. One counterexample is enough: for example, say that we had cake sizes (1,3,6,7)—DM chooses slice size 3 since it's is closest to the average size. But from (3,6,7) the DM chooses size 6, which is now closest to the average. The second set is a subset of the first but 3 is not chosen from the smaller set.

   b) Consider an application of the optimal stopping model of satisficing. There are n items each of whose utility to the decision maker is drawn independently from a uniform distribution on $[0, 1]$. What must the cost k of inspecting each item be such that the DM will optimally choose to stop searching after finding an item of utility $\frac{1}{2}$ or better?

   Say that you continue searching after finding something of utility $\frac{1}{2}$. There is a probability of $\frac{1}{2}$ that the next item will have utility of at least $\frac{1}{2}$ (by the properties of the uniform distribution). Conditional on the next item being better than $\frac{1}{2}$, it has an expected utility of $\frac{3}{4}$, which means the expected gain in utility over the item that has already been found is $\frac{1}{4}$.

   On the other hand, there is a probability $\frac{1}{2}$ that the next item will be worse than $\frac{1}{2}$, in which case there is no gain in utility. So the expected gain in utility from searching another item is $(\frac{1}{2} \times 0) + (\frac{1}{2} \times \frac{1}{4}) = \frac{1}{8}$. If the cost of searching another item is smaller than that, it is worth searching more even after finding an item with utility $\frac{1}{2}$, but if the cost of searching is bigger than that it is not worth searching more. $k = \frac{1}{8}$ induces a stopping threshold at utility of $\frac{1}{2}$.

5. Jim is procrastinating. He needs to write a problem set for Econ 119, but because of his busy social calendar he has a decision to make. There are three Zoom parties in the next three days, and Jim must choose one of them to skip so that he can write the exam. Party A is today, B is tomorrow, and C is the next and final day. Jim's instantaneous utility from each party is as follows:

$$U(A) = 5, U(B) = 4, U(C) = 7. \tag{1}$$

   On the day Jim skips a party to write the exam, he gets zero utility. First assume that Jim has time consistent preferences (exponential discounting) with $\delta = 1$.

   a) Which party will Jim skip?

   Party B. With $\delta = 1$ the total utility from the consumption stream is just the sum of the instantaneous utilities. Skipping party B has the lowest loss in utility of the three options.

   Now assume that Jim discounts according to the beta-delta model with $\delta = 1$ and some $\beta \in (0, 1)$.

b) For what range of β will Jim display time inconsistency (that is, making a plan but failing to stick to it)?

The problem is going to arise if Jim plans to skip party B but then, when tomorrow arrives, he changes his mind and skips C instead. We can check that he will never skip party A (since for any $\beta < 1$ that is definitely dominated by planning to skip B or C) and we can check that he will not plan to skip C (since that is dominated by planning to skip B). In sum, the utility in each case is Skip A: $U = 0 + \beta(4 + 7)$; Skip B: $U = 5 + \beta(0 + 7)$; Skip C: $U = 5 + \beta(4 + 0)$. For any $\beta \in (0, 1)$, he plans to skip B.

So for this to be an issue it would be that from the perspective of tomorrow, Jim must prefer to skip C than skip B. At time 1, $U = u_1 + \frac{1}{2}u_2$, and so the utility in each case is Skip B: $U = 0 + \beta(7)$; Skip C: $U = 4 + \beta(0) = 4$. The latter is greater if $\beta < \frac{4}{7}$. So any $\beta \in (0, \frac{4}{7})$ means we will observe a preference reversal.

c) Fix $\beta = \frac{1}{2}$. Say that each unit of utility is worth \$10 to Jim, and that he is sophisticated. From the perspective of today, how much would he be willing to pay for a commitment device that guaranteed he would stick the plan he makes today?

From the perspective of time zero, "skip C" yields 7 utility and "skip B" yields 8.5. Since each utility unit is worth \$10, Jim is willing to pay up to \$15 for the commitment device.

d) In c) we assumed that Jim was sophisticated. Briefly explain what it means in this context for a DM to be sophisticated vs. naive and why it matters for behavior.

A sophisticated DM anticipates their own time inconsistency: they forsee the problem and so in theory they may choose or seek out commitment devices and/or "get the task out of the way" to help them tie their hands. A naive DM does not forsee the problem and so will not demand commitment devices—they don't anticipate having a change of heart.

6. In class we saw applications of a rational inattention model to prices in the store and car odometer readings. Say that you conjecture that there might be rational inattention to digits after the decimal point in grade point averages. What would be your ideal data set to try to test that theory? Explain what effect you would be looking for and how your data would help you cleanly identify it. [300-400 words]

   Lots of settings in which you might be able to test this. Possibilities include admissions data for grad programs, hiring data for employers of new college grads, or experiments in which subjects evaluate CVs. The important part is that for your chosen setting you explain the data you would want to collect, what the outcome of interest would be, and, if possible, how you could begin to distinguish the rational inattention model from other potential explanations for what you may observe.

   For example, let's take the grad admissions data. Say that you have data on applications and admissions decisions for a large graduate degree program. So

you observe demographic characteristics and CVs of applicants, including their GPA, and you observe the decisions of the admissions committee on who to interview, who to advance to a second round of consideration, who to admit, or some combination of outcomes like these.

Let's conjecture that all else being equal a higher GPA results in a higher probability of a positive outcome for the applicant. For example, we will be interested in seeing if there are 'jumps' in the probability of receiving an admissions interview at the 2.99-3.00 or 3.99-4.00 boundaries. Correspondingly, we would be interested in knowing if the effect of an increase in GPA on the probability of being interviewed is smaller for increases that do not cross such a boundary than it is for increases that do cross such a boundary.

As we saw in the odometer paper in class, we could take such data as being consistent with the rational inattention model: the admissions officer readily notices the leading digit of GPA but pays less attention to differences after the decimal point. You may have taken inspiration from that paper by thinking of the experience level of an admissions officers as a relevant factor here; that would potentially be interesting data to have.

It would be important to understand potential confounds here though. Maybe the program has targets for how many applicants they admit above various GPA thresholds or perhaps they have formal cutoffs that applicants are supposed to meet. Maybe they have a completely different set of criteria for evaluating applicants. So a little bit of discussion about the institutional setting you chose would be valuable here to understand whether the setting is amenable to looking for the rational inattention effect.

You may also have considered proposing a field or lab experiment here to generate the data you were looking for.