Midterm Microeconomics 2020

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Problem 1. (20 points) Consumer Theory with the Weak Axiom of Revealed Preference. WARP.

Let $X = \mathbb{R}^L_+$ be the standard commodity space with $L \geq 2$.

Define a preference function $r : X \times X \to \mathbb{R}$ associated with a preference relation $\succeq \subseteq X \times X$, such that $r(x, y) \geq 0$ if and only if $x \succeq y$ for any $x, y \in X$ (and $r(x, y) > 0$ if $x \succ y$). Notice that $\succeq$ may not be rational.

Consider the following particular model of consumer behavior. For each $j \in \{1, \cdots, J\}$, let U_j be a a finite collection of utilities such that $u \in U_j$, is $u : X \to \mathbb{R}$ it's a utility function that is continuous, strictly monotone and concave. Now, consider a consumer that has the following preferences (multiple-utility–MU–model):

$$r(x, y) = \max_{j \in \{1,\cdots,J\}} \min_{u \in U_j} (u(x) - u(y)).$$

Intuitively, this MU model says that the consumer does not have a single utility to compare between any two consumption bundles, it may have many such utilities. In order to decide if she likes x better than y, this consumer first picks the worst case over a particular criterion U_j $\min_{u \in U_j}(u(x) - u(y))$, and then if there is at least one criterion (some j) for which $\min_{u \in U_j}(u(x) - u(y)) \geq 0$ the comparison is favorable to x with respect to y, then it will declare that $r(x, y) \geq 0$ (i.e., the max over j is equivalent to the previous statement).

Let $\mathcal{A} \subseteq 2^X \setminus \emptyset$ be a collection of menus/choice sets

We define a choice correspondence $c : \mathcal{A} \to 2^X \setminus \emptyset$ by $c(A) \subseteq A$. We say that a choice correspondence admits a MU preference function rationalization if

$$c(A) = \{a \in A : r(a, b) \geq 0 \forall b \in A\},$$

where r is a MU such that $r(x, y) = \max_{j \in \{1,\cdots,J\}} \min_{u \in U_j}(u(x) - u(y))$ for any $x, y \in X$.

Let $\succeq^D$ be defined as the direct revealed preference such that $x \succeq^D y \iff x \in c(A)$ and $y \in A$, and $x \succ^D y \iff x \in c(A)$ and $y \in A$ but $y \notin c(A)$. We say WARP holds if $x \succeq^D y$ implies not $y \succ^D x$.

1. Show that associated preferences $\succeq$ to the MU preference function above may fail to be rational. Hint: Build a particular model that fails transitivity or completeness, that it's a MU preference function. You can simplify the problem assuming for this numeral only that X is finite and that $\mathcal{A}$ consists of tuples and triples $\{x, y\}$, $\{x, y, z\}$.

2. Show that when the multiple criteria are coherent, namely $U_j \cap U_i \neq \emptyset$, then a choice correspondence that admits a MU preference function rationalization satisfies WARP. Namely, if $x \succeq^D y$ then it cannot be that $y \succ^D x$.

3. (Partial converse) Assume now that $\mathcal{A}$ is such that it contains every tuple and triple choice set such that $\{x, y\}, \{x, y, z\} \in \mathcal{A}$ for every $x, y, z \in X$. Show that if a choice correspondence c defined on this collection of choice sets satisfies WARP then there is a MU preference function that rationalizes it. For this exercise you can assume that the preference relation that rationalizes this data set is a continuous preference relation and that $X \subseteq \mathbb{R}^L$. (Hint: note that we are assuming that the choice correspondence it's nonempty).

Problem 2. (20) Testing WARP for consumer data. We say that a data set $O^T = \{p^t, x^t\}$ with $p^t \in \mathbb{R}^L_{++}$ and $x^t \in \mathbb{R}^L_{+}$ for $L \geq 2$, satisfies WARP if $p^t x^t \geq p^t x^s$ implies not $p^s x^s > p^s x^t$ for all $t, s \in \{1, \cdots, T\}$ (T is the finite number of observations $T \geq 2$). Notation: $v_1 v_2 = \sum_{l=1}^{L} v_{1,l} v_{2,l}$ for $v_1, v_2 \in \mathbb{R}^L$.

Download the replication package of Aguiar Kashaev (2020, Restud) from .

It contains the data set from:

- Ahn, D., Choi, S., Gale, D., & Kariv, S. (2014). Estimating ambiguity aversion in a portfolio choice experiment. Quantitative Economics, 5(2), 195-223. [Replication files]

`<http://qeconomics.org/supp/243/code_and_data.zip>`

(i) Use the file ReplicationAK/Data_all/rationalitydata3goods.csv to test WARP for each individual in the experiment. Provide the Julia (or "R") code name_lastname_ps3.jl and the results in written form in your submission. Hint: you can use the file

`/ReplicationAK/SecondApp/Deterministic_test/2App_dt.jl`

in Julia 1.0 or 1.1, or if you use another version of Julia you can use it as a basis for your code. In both Julia or R you must provide your own test of WARP you cannot use an "R" package, however you can use any implementation of the WARP test as the basis of your code.

(ii) Define the Afriat's efficiency index for WARP in an analogous way to the case of GARP, and compute it in the same data set. Provide the Julia code name_lastname_ps3.jl and the results in written form in your submission.

(iv) Show by means of an example that there are finite data sets O^T that satisfy WARP but fail GARP. (Hint: make it simple you can do this example with $T = 3$).

(iii) Compute the Afriat's efficiency index for GARP in the same data (if you did this in your problem set then this is the same, provide your code for this as well). Then run a linear regression between the Afriat's efficiency index for GARP vs the explanatory variable the Afriat's efficiency index for WARP and report the slope coefficient. Interpret this coefficient and discuss the result with respect to item (ii).

Problem 3. (Attraction Effect and Choice Overload)

(60 points) (Too much choice/Choice overload and the Attraction Effect) Propose a model for consumer behavior that captures the following stylized facts.

- Choice Overload: Consumers are more likely to choose an outside option (that we equate in this problem to not choosing) when the size of the menu is too big. Hint: The choice set is $X \cup \{o\}$ where o is an outside option (not in X). Let X be finite. Menus are of the form $A \cup \{o\}$ where $A \subseteq X$, i.e., the outside option is always available to the consumer.
- Attraction Effect:The **attraction effect** is the observation that if we add an alternative to a menu, then some existing item becomes more attractive to the consumer and is picked by her. This introduced object is usually called the decoy.

In formal terms, $b^- \in X$ be the decoy, so we are going to study its impact in the choice of the object of interest $b \in X$. The observation is the following:

$$b \in c(A \cup \{b^-\})$$

$$b \notin c(A), b \in A.$$

In probabilities, it means that

$$p(b, A \cup \{b^-\}) > p(b, A).$$

1. You should describe with words what is the consumer choice algorithm. The model can be deterministic or stochastic, your choice.

2. Then you should describe what is "new" in your model and how that relates to some behavioral or bounded rationality feature we learned in class, and how it differs from utility maximization.

3. Finally you should write the behavioral maximization problem and show how your new model predicts the two stylized facts. Also show, that the rational benchmark cannot deal with this models (neither random utility or deterministic utility maximization can predict the choice overload or attraction effect).

4. You should try to explain the model to me in the best way you can, by using words, diagrams and examples. However, you should have also formality, make the effort to write down the model using math, this is the only way to get full credit.

5. Describe what other testable implications your proposed model has.

Grading Criterion

1. Work group is not allowed, if I find out that several of you have essentially the same model, you will receive the total grade of this question divided by the number of students that share the same response.

2. The last question will be graded on the following 5 items: Logical consistency of the decision algorithm. Clarity of the explanation of the decision algorithm. Degree of success in explaining the behavioral effects. Clarity in the explanation of the behavioral effect using the decision algorithm. Ability of your model to be able to have testable implications (not everything goes).