Appendix E
The Theory of Choice

In this appendix, we briefly review the theory of consumer choice. It is provided both as a background and reference on the core concepts of choice theory.

The most widely used theories of choice assume customers are *rational* decision makers who intelligently alter when, what, and how much to purchase to achieve the best possible outcome for themselves. This is a quite plausible assumption. Moreover, an important consequence of this rationality assumption is that customer behavior can be "predicted" by treating each customer as an agent that optimizes over possible choices and outcomes. Optimization theory can then be used to model their behavior. Indeed, for these reasons rational-customer models are the basis of most economic theory.

Yet despite the theoretical and intuitive appeal of the rationality assumption, instances of deviations from rational behavior are observed in experiments and in real life. Alternative theories of choice have emerged to explain such behavior. These models assume customers are not perfectly rational—that there are limits to how cleverly they behave or that they exhibit irrational biases in their choice decisions. These so-called *behavioral theories* are surveyed below as well.

Choice and Preference Relations

Given two alternatives, a *choice* corresponds to an expression of preference for one alternative over another. Here, "alternatives" may refer to different products, different quantities of the same product, bundles of different products or various uncertain outcomes (such as buying a house at the asking price versus waiting and bidding in an auction against other buyers). Similarly, given n alternatives, choice can be defined in terms of the preferences expressed for all pairwise comparisons between the n alternatives.

The mathematical construct that formalizes this notion of choice and preference is a *preference relation.* Customers are assumed to have a set of *binary preferences* over alternatives in a set *X.* That is, given any two alternatives x and y in *X,* customers can rank them and clearly say they prefer one over the other. This is represented by the notation $x \succeq y$. A customer strictly prefers x to y, denoted $x \succ y$, if he prefers x to y, but does not prefer y to x (that is, he is not indifferent between the two alternatives).