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Rational Choice Theory: An Overview

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Abstract:
It seems easy to accept that rationality involves many features that cannot be summarized in terms of some straightforward formula, such as binary consistency. However, this recognition does not immediately lead to alternative characterizations that might be regarded as satisfactory, even though the inadequacies of the traditional assumptions of rational behavior standard used in economic theory have become hard to deny. It will not be an easy task to find replacements for the standard assumptions of rational behavior. That can be found in the traditional economic literature, both because the identified deficiencies have been seen as calling for rather divergent remedies, and also because there is little hope of finding an alternative assumption structure that will be as simple and usable as the traditional assumptions of self-interest maximization, or of consistency of choice.

Keywords: Rational, Economic Theory, Replacements, Self-Interest Maximization.

Introduction

Rational Choice Theory is an approach used by social scientists to understand human behavior. The approach has long been the dominant paradigm in economics, but in recent decades, it has become more widely used in other disciplines such as Sociology, Political Science, and Anthropology. This spread of the rational choice approach beyond conventional economic issues is discussed by Becker (1976), Radnitzky and Bernholz (1987), Hogarth and Reder (1987), Swedberg (1990), and Green and Shapiro (1996).

The main purpose of this paper is to provide an overview of rational choice theory for the non-specialist. I first outline the basic assumptions of the rational choice approach, and then I provide several examples of its use. I have chosen my examples to illustrate how widely the rational choice method has been applied (Varian, 1997: 98).

In the paper, I also discuss some ideas as to why the rational choice approach has become more prevalent in many disciplines in recent years. One idea is that the rational choice approach tends to provide opportunities for the *novel confirmation* of theories. I argue that these opportunities are the result primarily of the mathematical nature of the approach.

I then consider several issues raised by rational choice theory. First, I compare the

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limited meaning of "rationality" in rational choice theory with the more general definitions of the term use by philosophers. Second, I describe some of the main criticisms that have been levied against the rational choice approach. Third, I consider the limitations of rational choice models as guides to public policy. Fourth, I review some Christian perspectives on the rational choice approach (Hausman, 1984:44).

I end the paper by outlining three sets of questions I would like us to discuss in the faculty development seminar.

Before I proceed, an apology and a caveat are in order. I apologize for the length of this paper. The British publisher Lord Beaverbrook once apologized to a friend for sending a five- page letter, saying he did not have time to write a one-page letter. I have the same sentiment here.

The caveat is that my discussion of the rational choice theory in this paper is necessarily simplistic, so the reader should not take it as definitive. If some element of the theory seems suspect in some way, there will nearly always be an advanced version of the theory published somewhere that is more subtle and nuanced. Most statements in this paper are subject to qualification along many lines, so the reader should view what I present here keeping in mind the goal of the paper, which is only to give the reader some sense of the overall flavor of the rational choice approach (Hogarth,1987:57).

Basic Assumptions about Choice Determination

Rational Choice Theory generally begins with consideration of the choice behavior of one or more individual decision-making units – which in basic economics are most often consumers and/or firms. The rational choice theorist often presumes that the individual decision-making unit in question is "typical" or "representative" of some larger group such as buyers or sellers in a particular market. Once individual behavior is established, the analysis generally moves on to examine how individual choices interact to produce outcomes.

A rational choice analysis of the market for fresh tomatoes, for example, would generally involve a description of (i) the desired purchases of tomatoes by buyers, (ii) the desired production and sales of tomatoes by sellers, and (iii) how these desired purchases and desired sales interact to determine the price and quantity sold of tomatoes in the market. The typical tomato buyer is faced with the problem of how much of his income (or more narrowly, his food budget) to spend on tomatoes as opposed to some other good or service. The typical tomato seller is faced with the problem of how many tomatoes to produce and what price to charge for them (Mason, 1996: 548).

Exactly *how* does the buyer choose how much of his income to spend on tomatoes? Exactly *how* does the seller choose how many tomatoes to produce and what price to charge? One could imagine a number of answers to these questions. They might choose based on custom or habit, with current decisions simply a continuation of what has been done (for whatever reason) in the past. The decisions might be made randomly. In contrast, the rational choice approach to this problem is based on the fundamental premise that *the choices made by buyers and sellers are the choices that best help them achieve their objectives, given all relevant factors that are beyond their control.* The basic idea

behind rational choice theory is that people do their best under prevailing circumstances (Simon, 1987: 9).

What is meant, exactly, by "best achieve their objectives" and "do their best?" The discussion in this section will emphasize the choices of consumers. The rational choice theory of consumer behavior is based on the following axioms regarding consumer preferences:

(1) The consumer faces a known set of alternatives.
(2) For any pair of alternatives (A and B, say), the consumer either prefers A to B, prefers B to A, or is indifferent between A and B. This is the axiom of *completeness*.
(3) These preferences are *transitive*. That is, if a consumer prefers A to B and B to C, then she necessarily prefers A to C. If she is indifferent between A and B, and indifferent between B and C, then she is necessarily indifferent between A and C.
(4) The consumer will choose the most preferred alternative. If the consumer is indifferent between two or more alternatives that are preferred to all others, he or she will choose one of those alternatives -- with the specific choice from among them remaining indeterminate.

When economists speak of "rational" behavior, they usually mean only behavior that is in accord with the above axioms. I consider the definition of "rationality" in more detail near the end of the paper below (Sugden, 1991:89).

Rational choice theories usually represent preferences with a *utility function*. This mathematical function assigns a numerical value to each possible alternative facing the decision maker. As a simple example, suppose a consumer purchases two goods. Let *d*enote the number of units of good one consumed and *y* denote the number of units of good two consumed. The consumer's utility function is given by $U = U(a, i)$, where the function $U(\cdot, \cdot)$ assigns a number ("utility") to any given set of values for *x* and *y*. The properties of a large number of specific function forms for $U(\cdot, \cdot)$ have been considered. The analysis is by no means restricted to two goods, though in many cases the analyst finds it convenient to assume that *x* is the good of interest is and *y* is a "composite good" representing consumption of everything *but* good *x*.

The function $U(\cdot, \cdot)$ is normally assumed to have certain properties. First, it is generally assumed that *more is preferred to less* – so that U rises with increases in x and with increases in y. Another way of saying this is to say that marginal utility is positive – where the term "marginal utility" is the change in utility associated with a small increase in the quantity of a good consumed. The second property of $U(\cdot,\cdot)$ is that of *diminishing marginal utility*, which means that the (positive) marginal utility of each good gets smaller and smaller the more of the good that is being consumed in the first place. One's first Dr. Pepper after a workout yields quite a lot of satisfaction. By the fifth or sixth, the additional satisfaction, while still positive, is much smaller (Yuengert, 2001:17).

An important result in consumer theory is that a preference relationship can be represented by a utility function only if the relationship satisfies completeness and transitivity. The converse (that any complete and transitive preference relation may be represented by a utility function) is also true if the number of alternatives is finite. [Mas-Collel, Whinston, and Green (1995: 9)] If the number of possible alternatives is infinite, it may not be possible to represent the preference relation with a utility function.

Rational choice analysis generally begins with the premise that some agent, or group of agents, is [are] maximizing utility – that is, choosing the preferred alternative. This is only part of the story, however. Another important element of the choice process is the presence of *constraints*. The presence of constraints makes choice necessary, and one virtue of rational choice theory is that it makes the trade-offs between alternatives very explicit. A typical constraint in a simple one-period consumer choice problem is the *budget constraint*, which says that the consumer cannot spend more than her income. Multi-period models allow for borrowing, but in that case, the constraint is that the consumer must be able to repay the loan in the future (Varian, 1997: 78).

The use of utility functions means the idea of agents making the preferred choices from among available alternatives is translated into a mathematical exercise in constrained optimization. That is, an agent is assumed to make the feasible choice (feasible in a sense that it is not prohibited by constraints) that results in the highest possible value of his or her utility function. Constrained optimization methods (based on either calculus or set theory) are well developed in mathematics.

The solution to the constrained optimization problem generally leads to a decision rule. The decision rule shows how utility-maximizing choices vary with changes in circumstances such as changes in income or in the prices of goods.

A third element of rational choice analysis involves assumptions about the *environment* in which choices are made. Simple economic models are often restricted to choices made in *markets*, with emphasis on how much of each good or service consumers want to purchase (or firms want to produce and sell) under any given set of circumstances (Radnitzky,1987: 65).

A fourth element of rational choice analysis is a discussion of how the choices of different agents are made *consistent* with one another. A situation with consistent choices in which each agent is optimizing subject to constraints is called *equilibrium*. In the fresh tomato market, for example, the choices of buyers and sellers are consistent if the quantity of tomatoes consumers want to purchase at the prevailing price is equal to the quantity that firms want to produce and sell at that price. In this as in other simple market models, price plays a key role in the establishment of equilibrium. If consumers want to purchase more than firms are producing, the price will be bid upward, which will induce more production by firms and reduce desired purchases by consumers. If consumers want to purchase less than firms are producing, the resulting glut will force prices down, which will reduce production by firms and increase purchases by consumers (Mas-Collel, 1995: 43).

Fifth and last, in the absence of strong reasons to do otherwise such as the imposition of price controls by the government, the analyst employing rational choice theory will generally assume that *equilibrium outcomes in the model are adequate representations of what actually happens in the real world*. This means, in the above example, that a rational choice theorist would explain changes in the *actual* price of tomatoes observed in the real world by looking for possible causes of changes in the equilibrium price of tomatoes in her model.

Extensions

The basic rational choice theory described above has been extended in a number of

ways. I will consider four important ones in this section, though there are of course many others.

First, the basic theory accounts only for choice at a given time – that is, the model is *static*. In contrast, a *dynamic* (or *inter-temporal*) model allows the agent to plan as well as make choices in the present. In a dynamic model, the agent is still assumed to maximize utility, but the concept of utility is generalized to include not only present satisfaction but also future satisfaction. The agent does not just make choices today – he makes a *plan* for current and future choices. In this case, it may well be "rational" to sacrifice (e.g., consume less or work more) today in order to obtain some better outcome tomorrow. The dynamic formulation is an essential element of theories of saving and investment (Yuengert,2001: 67).

One issue that arises in dynamic models is that of *discounting*. In most dynamic models, the agents under consideration are assumed to prefer (other things equal) a given level of consumption in the present to a given level of consumption in the future. Consider a model with two periods, *1* and *2*. Let U_1 denote the agent's utility in period *1* and U_2 denote utility in period *2*. (U_1 and U_2 can depend on a number of factors, some of which can be controlled by the agent.) The agent would then be assumed to formulate a plan for periods 1 and 2 to maximize the sum $V = U_1 + \delta U_2$, where $0 < \delta \leq 1$ is the "discount factor."[1] A specification of $\delta < 1$ means that a given utility is worth less to the agent in the future than in the present, and is denoted a "positive rate of time preference" or simply "time preference." Olson and Bailey (1981) give a justification for time preference. Elster (1984, pp. 66ff) summarizes the opposing view that "... for an individual the very fact of having time preferences, over and above what is justified by the fact that we are mortal, is irrational and perhaps immoral as well." In any case, dynamic models with positive time preference are pervasive in the rational choice literature (Varian, 1997: 99).

The basic rational choice model assumes all outcomes are known with certainty. A second extension of the basic model involves explicit treatment of *uncertainty*. This is important in rational choice models of crime, for example, where a rational agent is assumed to consider the chance he or she will be apprehended while committing a criminal act. The rational choice model is extended to allow for uncertainty by assuming the agent maximizes *expected* utility. Uncertainty is characterized by a probability distribution that assigns likelihood (probability) to each possible outcome. Suppose there are two possible outcomes (for example, the prospective criminal is apprehended while committing a crime, or not apprehended while committing the crime), which we can denote outcome *A* and outcome *B*. Let p_A denote the probability that outcome *A* will occur p_B denote the probability of outcome *B*. With these as the only possible outcomes, it is clear that $p_A + Pb = one$ -- that is, there is a 100% chance that either *A* or *B* will occur. Let *U (A)* be the agent's utility with outcome *A* and *U (B)* be the agent's utility with outcome *B*. The agent is then assumed to maximize expected utility, which is the sum of utility in each outcome weighted by the probability that outcome will occur: $V = p_A \cdot U(A) + p_A \cdot U(B)$. In general, the choices of the agent can affect p_A and p_B as well as *U (A)* and *U (B)*.

A related (and third) area in which the rational choice model is extended involves *incomplete information*. In the basic model described above, the agent knows perfectly all the qualities of the goods under her con-

1. One might wonder if the consumption planned for period two while planning in period 1 is still optimal when period 2 arrives. Economists refer to the situation in which the period 1 plan is not optimal as a situation of time inconsistency. This possibility was first analyzed by Strotz (1955-1956) and is discussed at length by Elster (1986).

sideration. More generally, an agent may have to make choices when she does not have full information. A university generally does not have full information about the future research productivity of a new assistant professor, for example, and a used car buyer cannot be certain that he is not driving a "lemon" off the lot (Arrow,1994: 7).

The fourth area in which the basic rational choice model is extended involves *strategic behavior*. This generally occurs in situations in which there are only a few agents. The key issue is that each agent must take into account the likely effect of his actions on the decisions of other agents, all of whom are looking at the situation the same way. A classic ongoing example of this kind of interaction involves the crude-oil production decisions of the Organization of Petroleum Exporting Countries (OPEC). Acting collectively, OPEC members have an incentive to restrict production to keep the world price of crude oil high. Thus, each OPEC country is given a production quota – a limit on the amount it can produce. Each country acting individually, however, has an incentive to "cheat" on its quota and thereby be able to sell more crude oil at the high price. This will only be successful if the other countries maintain their quotas, however, thereby keeping the price high (Radnitzky,1987: 66). Thus, when a country is contemplating the breach of a quota, it must consider how other member countries may react. The branch of economics that deals with strategic interactions is called *game theory*.[1]

A Brief Description of the Rational Choice Method

Like most scholarship, rational choice analysis usually begins with a question. What determines church attendance? Are suicide rates affected by the state of the economy? Do seat belt laws make highways safer? Under what circumstances are "cold turkey" methods necessary to end addictions? Why are drivers of certain minority groups more likely to be pulled over by police? Which soldiers are most likely to suffer casualties in a war? Why can't Yasser Arafat and Ariel Sharon just get along? Why did large mammals become extinct in the Pleistocene era? When are workers most likely to "shirk" their job responsibilities? Does a reported decline in "consumer confidence" portend a slowdown in the economy?

Varian (1997, p. 4) describes the model-building process as follows:

All economic models are pretty much the same. There are some economic agents. They make choices in order to advance their objectives. The choices have to satisfy various constraints so there is something that adjusts to make all these choices consistent. This basic structure suggests a plan of attack: Who are the people making choices? What are the constraints they face? How do they interact? What adjusts if the choices aren't mutually consistent? (Varian, 1997: 98)

I will provide a slightly more detailed description here. Rational choice analysis may be characterized as working through the following steps:

1. Identify the relevant agents and make assumptions about their objectives.
2. Identify the constraints faced by each agent.
3. Determine the "decision rules" of each agent, which characterize how an agent's choices respond to changes of one kind or another – for example, how the quantity of tomatoes purchased,

1. The recent film A Beautiful Mind, which won the 2001 Academy Award for Best Picture, depicts the life of John Nash, a Princeton University professor who won the Nobel Prize in Economic Science for his work in game theory.

might change with price or income. This task is usually accomplished mathematically by the solution of a constrained optimization problem.

4. Determine how the decision rules of various agents may be made consistent with one another and thereby characterize the equilibrium of the model.[1] Effective analysis of complex interactions between agents normally involves the use of mathematical methods, which can sometimes be quite sophisticated.
5. Explore how the equilibrium of the model changes in response to various external events. That is, determine the *predictions* or *implications* of the model. Again, this step can involve substantial use of mathematics.
6. Examine whether the predictions determined in step (5) are consistent with actual experience. This step often involves the statistical analysis of data and can involve sophisticated techniques (to control sample selection bias, for example).
7. Draw conclusions and any implications (for government policy, for example) implied by (6).

It is often the case that the question at hand may be addressed by reference to standard theoretical results (e.g., people generally want to consume less of a product when its price increases). In these circumstances, the analyst often will not specify and solve a rational choice model explicitly. Instead, she will assume the reader understands that the model could be specified and solved if necessary and would have conventional implications (Hogarth,1987).

Conclusion

In this paper, I have tried to give the reader a sense of how rational choice theory works and of its methodological foundations. The theory is making substantial inroads into a number of social science disciplines. There are two possible explanations for this fact. First, the theory is useful in that it generates novel predictions and provides useful insights. Second, everyone using the theory is a misguided reductionist driven by perverse ideological motivations. Though there is probably a bit of truth in both explanations, I think the former is probably closer to the truth than the latter (Elster,1986: 68).

Rational choice theory is subject to a number of criticisms, but that is to be expected. We are not likely to attain complete knowledge about anything, especially social phenomena – any time soon. Refer to the quotes from Churchill and Sen shown on the first page of this paper. To paraphrase Churchill, rational choice theory may well be the worst social science methodology ever invented except for all the others. I believe this means we should be open to the insights provided by rational choice theory without embracing the approach with religious fervor. The approach can be useful, or it can be misleading. So can all other approaches.

I close with three sets of questions I would like for us to consider in our deliberations during the seminar:

1. Does the basic rational choice approach in which preferences are assumed to depend only on material self-interest actually encourage people to make choices primarily because of material self-interest? If so, how? If the rational choice approach is amended to allow for non-selfish preferences, will the typical person in society gradually become less selfish?

1. It is possible that a model will have no equilibrium or more than one equilibrium. I address this possibility of multiple equilibrium near the end of the paper.

2. Why is it that the application of rational choice methods in certain areas is troubling to some people? Why do some people resent being represented as utility-maximizing machines with respect to certain aspects of our behavior – in particular, those aspects of behavior that provide the most meaning in our lives – faith, hope and love? Are there limits to the legitimate scope of rational choice inquiry? That is, should we rule out *a priori* the application of rational choice methods to some questions? Do sacred things lose their meaning if we come to view them through a rational choice lens?
3. Should the use of rational choice methods by a Christian scholar differ in an important way from how they are used in the mainstream literature? If so, how? Why?

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