A SURVEY OF QUALITATIVE ANALYSIS FOR ECONOMICS AND FINANCE DECISION MAKING

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ABSTRACT

Our research on household financial planning motivated this study. This problem may require a qualitative methodology given its complexity and the need to include information of different kinds. We review qualitative methodologies in the social sciences, cognitive sciences (psychology, computer science, information sciences), and philosophy. We also review mathematical tools to model with linguistic variables and grouping of qualitative items. The last section of our study focuses on fuzzy sets-based qualitative methodologies and, especially, on relational equations possibilistic modeling. Some of our findings are the following. In economics and finance may be appropriate to follow the example of our colleagues in the social sciences and adopt the best methodology the problem permits, rather than making the problem fit a specific quantitative methodology. Using qualitative methods does not mean being less rigorous, or less mathematical, or more arbitrary, than when using quantitative methods. Most importantly, qualitative methodologies and approximate methods are already available, which may enable us to face our complex, information-rich systems. Fuzzy sets-based methodologies making use of natural language are particularly promising.

INTRODUCTION

This study is part of ongoing research on household financial planning. Financial planning problems require information concerning: a) the decision-maker (goals, expectations, detail concerning health, dependents, etc.); b) the tools to be employed (real assets such as houses, financial, and insurance assets); c) the context (culture, social arrangements, etc.); and d) the system (economic, financial) in which the plan is made. The information required clearly suggests the problem will never be fully quantifiable. In other words, we will always need more knowledge than that provided by quantitative models, assuming they are available to begin with.

The traditional objections to "quant-only" models are well known: decision-making problems are laced with subjective elements; there are also social elements in most of our decisions; measurements are always limited in their accuracy, some items cannot be quantified; and lastly, quantitative models are always incomplete. Something, however, has changed in our world that makes us rethink our modeling efforts: the information age. The increasing complexity in economic and business decision-making is paralleled by an explosion of information.

This study is organized into two major parts. The first part focuses on 1) methodologies in the social sciences, 2) qualitative methods in cognitive sciences (computer science and cognitive psychology), and 3) qualitative mathematics. This first part is necessarily sketchy for reasons related to our intended readership, a) who may be familiar with some of the approaches (essay writing and rhetoric, biography), or b) who may not make much use of some of methods (ethnographic research, phenomenology), or c) because the second part of the study focuses on those research initiatives of particular interest in economics and business decision-making.

ALTERNATIVE METHODOLOGIES

In this section we review approaches to qualitative analysis in the social and cognitive sciences. In the last part of this section we stress that choosing qualitative or quantitative approaches has little to do with the analysis "being mathematical" or not.

Our first stop is in the areas of social sciences, where we evaluate the following qualitative analysis methodologies. 1) Ethnography. It focuses on individuals within particular cultures, groups, or organizations. 2) Grounded theory, which applies a sequential process of refinement to observations to enhance concepts and categories used in the analysis. 3) Case studies (also referred to as biography, life stories). 4) Phenomenology, which focuses on strongly subjective processes related to human experience as in, for example, consciousness of dying or living. Perceptions of quality and satisfaction. Effort to find meaning and explanation by individuals. Introspection, subjective. 5) Narrative studies, which identify the flow of events as a basic story; there is a teller, an audience, and a meaning of the "plot." 6) Discourse analysis, which includes conversation analysis, and institutional communication analysis; 7) Content analysis, which involves identifying key terms (categories, concepts, special words) and studying how and when they appear in a piece of text. 8) Analytic induction, which, like grounded theory, implements successive refinements of research hypothesis, data, and testing. 9) Policy and evaluation analysis, which is a methodology to ensure adequate representation of the parties or elements involved in the problem, a comprehensive evaluation of relevant material, and a complete evaluation of outcomes.

Our next stop is what is known as cognitive sciences. Different forms of qualitative analysis in cognitive psychology include: concept creation, concept delimitation and transmission, gestalt theory, schema theory, computer simulation, and analogical thinking. In computer/information sciences, the heading "artificial intelligence" includes the following qualitative initiatives of interest for economics and business decision making: 1) knowledge representation, 2) concept analysis, 3) category theory, 4) diagrammatic reasoning, and 5) conceptual spaces and mappings. Other methodologies studied in computer science are: 1) neural networks, 2) database management, 3) artificial intelligence, and 3) fuzzy sets.

This part of the study also includes research on qualitative approaches in philosophy. The most important observations in the first part of the study are:

a) We should follow the example of our colleagues in the social sciences, who adopt the best methodology the problem permits, rather that making the problem fit a specific methodology. In economics and finance we often deform the problem to fit either the mold of what is familiar (marginalism, probability theory, white noise, regressions towards the mean), or to use what is favored by current research trends (e.g., stochastic calculus, dynamic programming, ARCH models, option pricing, etc.). The problem is that we often disfigure the problem and maim the decision maker, and find ourselves in hardly defensible situations: like that of recommending hard-pressed retirees to buy specialized derivative contracts.
b) Cognitive sciences may progress faster than economics and finance in explaining behavior and decision-making simply because they are more open minded about using different methodologies.
c) Using qualitative methodologies does not mean being less rigorous or less mathematical.

MATHEMATICS WITH WORDS AND NUMBERS

The objective of this section is twofold: 1) to show that one can be mathematical, and all that this implies (formal, systematic, rigorous, reliable, scientific, etc.), without using the familiar calculus+probability models; and 2) to gather the tools and concepts that we will need to assess fuzzy sets based methods, which are overviewed in the third section.

The mathematical methodologies of interest are the following: 1) approximate equations, and 2) the algebra of sets and symbolic logic. The second part of the study stresses the following:

a) There is no need to limit ourselves to methods in which the presumption of exactness is achieved at the cost of mutilating problems and decision makers. There are approximate methods that extend the reach of conventional models by adding flexibility.
b) There are also methodologies that allow us to study decision-making using natural language.
c) Approximate methodologies may enable us to face complex systems and, especially, to encompass the complex dynamics at play in actual problems.

FUZZY SETS

Zadeh (1965) studied a) sets whose membership was a matter of degree, b) the impact of those constructs on traditional algebra of sets, and c) the necessary algebraic instrumental (operations, concepts) these sets require. As we know, the classifications of mutual funds, for example, has overlapping memberships when we evaluate returns and other characteristics. Moreover, some distinctions like that between "growth" and "value" are so tricky that it may be better to ignore them. Despite the frequency of overlapping classifications and issues that are a matter of degree, we still try to view the world with a binary lens (classical or Aristotelian logic, 0-1 membership functions in classical or "crisp" sets).

There are many lines of research in the methodology of fuzzy sets (FS). One focuses on words and linguistic labels, which may include practical usage of numbers. For example, a 10% expected return in large capitalization mutual funds is understood in practice as a range 8-12%. Another line of research builds on sets, classes, and relations. Alternative approaches often intersect. For instance, sets can be made of nouns, which can also be regarded as linguistic variables. In this sense, every utterance in finance and economics is either a fuzzy set or a linguistic variable. Approximate reasoning, also known as fuzzy logic, glues fuzzy concepts (world, numbers, and labels) together. It stresses approximate –but reliable– reasoning versus its classical and exact, but unreliable, counterpart. Possibility theory is the area of approximate reasoning that replaces probability theory when the latter is not applicable. All in all, fuzzy sets and approximate reasoning seem to have been custom-made to handle economic and financial matters: Do you need tax-exempt securities? Is your 401(k) plan good? Should individual investors buy international funds? What is better a Roth IRA or a conventional one? What is the difference between high-quality and high quality bonds? Do you recommend that retirees buy high quality bonds? What about international funds? … As you see, any of these sentences have more or less severely imprecise concepts; yet these are the types of statements we handle all the time.

We believe fuzzy sets-based methodologies are enhanced by assuming that agents, and especially individuals, use representations (not necessarily the thing itself) when making decisions. Overall, this study stresses the potential of fuzzy sets-based methodologies to enhance finance and economic decision-making.