SYSTEM FOR ECONOMIC SIMULATION

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ABSTRACT

The characteristics desirable in a system designed for the development and operation of simultaneous equation economic models are outlined. Classes of users are identified; and their needs are considered. Specifically, the point is made that a system for economic simulation must include a data management capability and facilities for the analysis of data and the estimation of parameters in addition to those required to exercise models.

INTRODUCTION

In the majority of problems to which simulation is applied, the actual process of exercising the model represents but a relatively small portion of the total amount of work that is to be accomplished. Rather, the bulk of the effort must go into the tasks of model formulation and verification. Furthermore, this latter observation is at least as valid in the case of simulation of economic systems using simultaneous equation techniques as it is in any other area where computer simulation models are employed. Thus, when considering the design of systems for the processing of simultaneous equation models of economic systems, one must consider the facilities required to estimate the structural relationships as well as those required to manipulate and exercise the model properly.

In addition to facilities for estimation and manipulation of a model, the system must provide the user immediate access to his data. Not only must the data be available to the system for use by the estimation and simulation programs, but it must be available to the user for his examination and study. The user should be able to store the results of his computations for later use in analysis as required. Specifically, it is necessary that the coefficients produced by the estimation procedures be made available both to the user and the programs that require them for the simulation operation itself.

For the most part, one may confine his thinking to those systems which provide for direct interaction with the users--systems operating in a time-sharing environment. Although some econometric procedures (e.g., full information, maximum likelihood and spectral analysis) may best be confined to operations in the batch mode, most of the more common techniques require sufficiently little computer time when using modern equipment to obviate any need to resort to batch processing.

CLASSES OF USERS

Generally, the systems of the type being considered should be designed to serve two classes of users. First, the largest and, therefore, probably the most important group of users is composed of applied econometricians who are knowledgeable of the procedures to be used but may be somewhat less interested in the detailed theoretical basis of these techniques and the technology required to implement them on a modern computer. These individuals are results oriented in that their interest lies primarily in the resolution of operational questions and not in the development of econometric technique per se. Further, they generally have a great desire to avoid the problems of developing computer programs and systems wherever possible.

In the second group are those users who are interested in the development as well as application of econometric technique. These researchers, of course, have use for existing procedures as implemented in operational systems for estimation and simulation. However, they also require the capability for defining in detail the component operations of a procedure and capturing intermediate results for further analysis. While this group is small relative to the others, it is the one that advances the state of the art and provides the input to the system designer that enables the latter to provide computational capabilities that are responsive to the needs of the entire user community.

Further consideration will be given only to systems for the estimation and operation of simultaneous equation models of economic phenomena. To support these models, it will be necessary to provide the user with facilities for the estimation of relationships, assessing and manipulating data and exercising simulation models.

Three types of simulations may be employed

during the development and operation of simultaneous equation models. First, and most simply, a single equation may be exercised to determine its reliability in forecasting independently of other equations in the model. Secondly, the entire model may be run in a period-to-period mode where observed rather than computed values are used for the lagged endogenous as well as the exogenous variables. Third, the entire model may be run in the full dynamic simulation mode where the values used for the lagged endogenous variables are those produced by the model for periods prior to the one for which it is currently being solved.

DESIGN CRITERIA

Based on these observations, it is possible to identify the following criteria to be used for the design of integrated systems for economic simulation:

1. The system must be user oriented and preferably conversational.
2. The user should be provided a language interface enabling him to think in terms familiar to the econometrician.
3. A data management facility that enables the user to create and maintain private data bases as well as providing access to public data should be included.
4. Provision for data analysis and the estimation of models should be made.
5. It should be possible to perform single equation, period-to-period and full dynamic simulations.
6. The needs of both the applied and research econometricians must be recognized.
7. The design should be open ended to facilitate the addition of capabilities as required.

EXISTING SYSTEMS

Systems satisfying to a significant degree the criteria listed above are operational. In particular, TROLL developed by the National Bureau of Economic Research and EPL which was developed and marketed by Data Resources, Inc. come closest to offering the completely integrated capability that is deemed to be desirable. However, as existing systems are enhanced and new ones become available, it is likely that the needs of the builders of economic models will be more fully satisfied than they are presently.

CONCLUDING REMARKS

Systems of the type that have been discussed are designed to bring the user closer to the machine and remove the technician from his place between the two. Generalized, highly versatile systems will tend to minimize the role of the programmer as an interface, and, instead, place him in the role of providing the end user an efficient tool for doing his work. The development of generalized systems for economic simulation is but one area in which this trend may be observed.

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