

VOLUME 15 NUMBER 3/4 MARCH/APRIL 1990

ISSN 0360-5442

TECHNOLOGIES

RESOURCES

RESERVES

DEMAND

IMPACT

CONSERVATION

MANAGEMENT

POLICY

The International Journal

*SPECIAL ISSUE*

**ENGINEERING-ECONOMIC MODELING:  
ENERGY SYSTEMS**

Part I

*Guest Editors:*

**John P. Weyant and Thomas A. Kuczmowski**



**PERGAMON PRESS**

Oxford · New York · Beijing · Frankfurt

São Paulo · Sydney · Tokyo · Toronto

## 2.1. ECONOMETRIC TECHNIQUES: THEORY VERSUS PRACTICE

PAUL J. WERBOS

Energy Information Administration<sup>+</sup>  
Department of Energy, Washington D.C.  
U.S.A.

Abstract - This paper introduces the basic concepts used in econometric modeling, and describes five prescriptions to avoid common real-world pitfalls in that style of modeling. The paper begins by comparing econometric modeling with other forms of modeling used in energy modeling and engineering. It describes what an econometric model is, and how to build one. It then gives a detailed explanation of many facets of the five prescriptions: pay attention to uncertainty; don't expect a free lunch when devising specifications; pay attention to prior information; don't expect to draw conclusions without adequate data; and check the historical track record of your model. The issues of generalization and robustness over time receive special attention; they are important in practice, and subtle in theory. Finally, the paper discusses model development in practice, building upon experience with PURHAPS, a model I developed for the Energy Information Administration (EIA).

### 1. BACKGROUND

Economic theory, in the United States, usually begins with simplifying assumptions like free markets, perfect competition, no externalities, and perfect foresight. After years of study, the advanced student is told how to modify this theory to address real problems in the real world, which are often quite different from the theory in important ways. Some students never quite make the adjustment.

Econometrics is very similar. This paper will introduce the novice to the basic assumptions and methods of econometrics, and then discuss problems which come up in modifying the theory to fit the real world.

Broadly speaking, there is no sharp dividing line between econometric models, engineering process models, statistical models, simple time-series models, systems dynamics models, etc. All these types of models are systems of equations designed to forecast or simulate whatever we want to forecast or simulate. The real difference lies in how we obtain information or parameters to plug into the models.

Some classes of models tend to rely on a priori information or indirect information about what we are forecasting; models of this sort include "pure" process models, classical systems-

---

<sup>+</sup>This paper expresses the views of the author, not those of EIA or DOE, though it was reviewed at EIA prior to submission. As this paper goes to press, the author's address has changed to: Room 1151, NSF, Washington D.C. 20550.

