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BOOK REVIEWS

Dynamic Programming: Applications to Agriculture and Natural Resources. By JOHN O. S. KENNEDY. (Elsevier Applied Science Publishers, London, 1986.) Pp. 341, ISBN 0 85334 424 8.

In 1963 Bellman (1963) stated 'What is now needed is a systematic exploitation of these methods to provide a backlog of solved problems which will guide our subsequent research'. Kennedy has added greatly to organising in a consistent framework a collection of such solved problems. As such, his book is a significant contribution to increasing the usefulness of an analytical tool which has been greatly limited in use by the curse of dimensionality.

The context chosen by the author is of the application of dynamic programming to the use of agricultural and natural resources. In this context it is argued that because of the frequent sequential nature of decision making problems dynamic programming is ideally suited for their analysis. The examples presented throughout the book clearly support this argument.

The book begins with a description of how various management techniques have been applied in the areas of farm management, forestry and fisheries, and launches very quickly into what is termed the 'general resource problem without replacement'. For the beginner in dynamic programming the introductory chapter may prove far too challenging as a means of getting started in what is gradually becoming one of the tools of trade for agricultural economists. An appendix to Chapter 1 will further deter the beginner in that a derivation of the discrete maximum principle using Lagrangian multipliers is given along with 'A Note on the Hamiltonian used in Control Theory'.

Chapter 2 of the text should be the starting point for the beginner although, even here, the uninitiated into the world of mathematical optimisation will not find a warm cosy feeling of understanding until parts of the chapter have been read and re-read a couple of times. In addition, a dictionary of terms or a management science text may be required as a companion. Bellman's principle of optimality is nicely explained by stating that an optimal policy consists of a 'nesting of shorter optimal policies' and then the various components of a dynamic programming problem are outlined. Applications to a least-cost network and a simple crop irrigation problem are used as illustrations. These are solved using the computer programs included in the book. The programs are written in a general fashion in standard BASIC and should provide many researchers and teachers with a means of using dynamic programming without too much involvement in the time consuming process of computer programming. They are designed to run on a wide range of computers which use the BASIC language.

With the preliminaries completed in Chapter 2, stochastic and infinite-stage dynamic programming are discussed in Chapter 3 and a variety of extensions are considered in Chapter 4. The remaining six chapters of the book, except for the final chapter, consist of worked examples from the areas of agriculture and natural resources.

Within the agricultural area a diverse set of problems is examined. They include the application of critical path analysis to a farm cropping cycle, optimal replacement of a tractor, grain buffer stock policies with stochastic yields, crop decision making, water management, pesticide management, fertiliser management with carryover, and livestock replacement including the related feeding decisions and the use of stochastic prices.

Applications to the use of natural resources similarly cover a wide range. The theory of exhaustible resources is developed using a mine as an example; the pollution problem, in which there are persistent effects over time, is examined and the question of land development as an irreversible decision under uncertainty is considered. The final two chapters of examples relate to forestry and fishery management. In relation to forestry, the optimal rotation problem is solved as both a deterministic problem and a stochastic problem giving the Faustmann formula for both cases. The problem is then extended to consider the optimal rotation in conjunction with thinning. Fisheries management is used as an example of how to obtain useful results both analytically and numerically. This chapter reflects the work by the author on the southern bluefin tuna industry.

Throughout the applications part of the book tables are given which summarise the published applications of dynamic programming. These summaries, which include a brief comment on the findings in each paper and some of the details of the models used, should prove very useful for those seeking a quick way of getting at the key references for a particular area of research. They also reflect the author's clear perception that much could be done with dynamic programming if only the technique were a little better understood.

The final chapter draws together the threads of the arguments for a more extensive use of dynamic programming. In this chapter the point is made that to formulate a dynamic problem in dynamic programming terms can lead to valuable insights, even without quantitative solutions. The point is also made that there is a 'symbiotic' relationship between models and data. Often there is a shortage of data for modelling work, particularly over time, and that data are often not collected until models are designed to solve practical problems. Arguments about the flexibility of dynamic programming, the ability to link it in with other optimising techniques and the progress in computing power all point to a convincing case on the wider use of dynamic programming.

This book is a very practical contribution to making the tools of dynamic analysis available to a much wider audience of applied economists. Although it is indicated in the preface that the book would be suitable for a course in dynamic programming its greatest use will no doubt be for researchers and applied economists trying to come to terms with the analysis of stochastic and dynamic problems. The generalised computer programs included in the book should greatly facilitate this process and also be a considerable aid to those teaching dynamic programming at both introductory and more senior levels.

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Reference

Bellman, R. E. (1963), *Dynamic Programming and Mathematical Economics,* Memorandum RM-3539-PR, Rand Corporation, Santa Monica, California.

Specification Analysis in the Linear Model (In Honour of Donald Cochrane). By MAXWELL L. KING and DAVID E. A. GILES (eds). (Routledge and Kegan Paul, London, 1987.) Pp. 358, ISBN 0 7102 0614 3.

This book was written to honour Donald Cochrane, a distinguished academic economist and educator, who died in 1983. In his capacity as Dean of Economics and Politics at Monash University, he greatly enhanced economic research and teaching. In this volume some former colleagues pay tribute to Cochrane's research in econometrics.

Cochrane is best known for his work with Orcutt. Together, they contributed to solving the specification problem of autocorrelated errors in the linear regression model. This book takes as its theme the analysis of specification problems in the linear model to which Cochrane's own research was directed. It comprises fifteen original articles as well as appendixes which reproduce the two key Cochrane and Orcutt papers and a related computational procedure due to Sargan.

The book is arranged in four parts. Part I is concerned solely with examining various features of the linear regression model with autocorrelated errors. The first two survey articles are concerned with linking and assessing the Cochrane–Orcutt research and current statistical literature. Of particular interest is E. J. Hannan's identification of a link between spectral regression methods and their analysis. Of greatest practical worth is Maxwell King's excellent evaluation of the power properties of various tests for autocorrelation. Applied researchers could well take note of the conclusions drawn from this literature.

King's survey is complemented by the remaining papers in Part I. These include an examination of the efficiency of estimators, establishing bounds on coefficient estimates and t-values and an illustration of the implications of autocorrelation in pre-test estimation. (Contributors to these articles include the editors as well as Murray Beattie, Grant Hillier, L. Magee, V. R. Srivastava and A. Ullah.) Part I is well rounded off by Peter Praetz's analysis of the effects on the Durbin–Watson test of some model misspecifications.

Part II of this volume covers rather diverse general model specification issues. A feature article is Michael McAleer's comprehensive survey on testing non-nested regression models. This provides useful interpretations of tests based upon Cox's principle and connects these to artificial regression procedures. Tests of linear and log-linear models are also discussed. The other two papers in this section are concerned with some fundamentals of modelling methodologies. In particular, Guy Orcutt provides a non-technical discussion of the importance of micro-analytical modelling in applied econometrics, advocating the use of micro-grouped joint conditional probability functions. Keith McLaren and Russel Cooper outline the intertemporal duality theories of the consumer and firm, focusing on the problems of generating tractable and consistent functional forms. Applied systems builders with elementary knowledge of the calculus of variation will find this a most concise treatment. Many of the more interesting questions in demand and supply systems analysis are best set in models which recognise dynamics.

Part III of the book examines two statistical issues. G. S. Watson considers alternative asymptotic approaches to spectral analysis of a cross-

product matrix. Basic background knowledge of complex variable theory is an essential prerequisite to an appreciation of this article. Arnold Zellner and Soo-Bin Park use Bayesian techniques to illustrate some important consequences of a common misspecification error: ignoring the random nature of regressors in prediction.

The final part of the book is entitled 'Applications'. However, articles in this section are not well integrated with earlier chapters. Richard Stone presents a technique for balancing data sets which contain accounting constraints. Stone applies this technique to the British National Accounts, while also examining the accuracy of these data. Those sceptical of the accuracy of the Australian National Accounts and the revisions done to the various series might want to investigate these techniques. Kenneth Clements and John Taylor examine the pattern of financial asset holdings in Australia using a systems approach with an AIDS demand model look alike. They find that the homogeneity and symmetry restrictions are rejected by a likelihood ratio test. Out-of-sample forecast errors grow over time. Perhaps the authors should have investigated the possibility of an inappropriate specification of dynamic behaviour? Instead they go on to compare their structural model with a Markov chain alternative and a logistic growth model for one of the assets.

In the final paper in this volume, Ross Williams provides a concise exposition of a procedure for discriminating between a distributed lag model with a lagged dependent variable and a model with autocorrelated errors and a lagged dependent variable introduced by transformation. Using this technique he investigates the dwelling commencement equation in the NIF-10 model of the Australian economy.

Overall this book provides an advanced guide to some of the most pressing theoretical and practical issues confronting students and users of the linear regression model. Most of the papers do assume a fair degree of statistical competence on the part of the reader—in this respect the usefulness of this volume is limited. However, with some effort, a basic understanding of the key points of the articles can be achieved by most brands of applied researchers. Since an understanding of specification problems is essential for sound applied work, greater emphasis on heuristic explanations and greater use of empirical case studies could well have remedied this deficiency. In addition, given the scope of the book's theme, a paper on diagnostic tests of model adequacy would also have complemented the key survey articles. Nevertheless this book is of extremely high quality and will be invaluable to post-graduate students of econometrics. It is also worth careful examination by all less formally trained applied users of the linear model.

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Rural New Zealand: What Next? By L. TIM WALLACE and RALPH LATTIMORE (eds). (Lincoln College, Canterbury, New Zealand, 1987.) ISBN 0 86476 018 3.

This little book covers a wide range of rural policy issues but remains with a characteristically New Zealand view. It contains much about demand uncertainty but little about disruption to supply. The authors record the zeal with which policies have been tried and abandoned over the years as governments supported, insulated or otherwise intervened to create controlled marketing of rural produce to match New Zealand's reliable production systems. This focus on uncertainty external to the farm is done at a very general level as the book is aimed at a general readership. Several authors also address a number of issues which influence the productivity and competitiveness of New Zealand farms and orchards.

The twenty-nine authors in about as many chapters cover what they think will shape the future of rural New Zealand. They are mainly agricultural economists from Lincoln College and Massey University. A few others provide contrasting views. The topics addressed are history, production, technology, demand, marketing, politics or social issues.

The book is a mixed bag of readings. It can be read through from start to finish or by taking the title at face value and deciding 'what next' to read after each chapter. To get oriented, I suggest the Overview paper by Hawke and the Politics and Agriculture paper by Kneebone. Then Ross on the Development of the Agricultural Industry. After that take your fancy, but prepare for disparate views and selected facts and insights.

There are indeed some interesting facts, as Johnson documents, about the massive government intervention over the 1960s to 1980s and its collapse when support could no longer be afforded. In other areas there is a dearth of fundamental information on product prices, land prices and elasticities which would help the reader to choose between some of the conflicting judgments made in different chapters. Unfortunately there are some inconsistencies; for example, the author is asked to believe statistics are for 1986-87 but come from a 1985 source!

Some of the book is academics preaching to farmers about what to do during a period of change. Elsewhere, others document and reflect on past change and Wallace analyses the course of the present maelstrom of change. The authors try to reassure that there will be a future for rural New Zealand provided New Zealanders continue to be skilful and quick to respond to changes in both markets and technology. The value of human resources is lauded.

The views of the ever dissenting Rosenburg are included, and while he may have been right in the 1960s in rejecting the policy of the day, his alternatives have as little appeal now as they did then.

Interestingly, education is not a topic covered in the text apart from reference to the costs of obtaining schooling in remoter rural areas. Macarthur considers information, communication and technology and shows his biases against the user pays principle. He does not venture into the looking glass and ask about the role of the educational institutions, especially those where agricultural economists are found. It seems reasonable to ask if they are relevant now to the needs of rural New Zealand and what, if any, role did they play in the analysis of policies that are now

largely rejected. Without this, the call of Macarthur, that the scientists and the farmer must be friends, rings hollow for the social science of economics. Could the research institutions have helped guide industry policy away from its pendulum swings and pitfalls had it been funded differently? Is there need for change in research and education arrangements to enable criticism, which Kneebone says is often viewed as heresy, to be produced and to be argued more effectively? This book itself in addressing a general readership fails somewhat. For example, a more critical stance may be needed from that provided by Schroder and Lattimore. These authors sometimes conveniently overlook the massive policy impact of the European Community's Common Agricultural Policy on prices within and beyond the EC.

Despite its shortcomings 'Rural New Zealand: What Next?' is a stimulating patchwork, at times self-righteously didactic but nonetheless a salutory text for those interested in agricultural policy.

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Food Policy Analysis in Thailand. By THEODORE PANAYOTOU (ed.). (Agricultural Development Bank, Bangkok, 1985.) Pp. 347.

Thailand and Australia share many common interests in food policy. Both countries are important food exporters in the ASEAN region. Both countries are subject to the unwanted pressures of 'unfair' subsidised competition from EC and North American farm sectors. Both countries are searching for national food and nutrition policies consistent with diversification away from traditional agricultural pursuits, sustainable exploitation of the nation's comparative advantages in agriculture, and fundamental structural changes which are arising from demographic factors, the momentum of technical change and scientific progress, and changing factor price ratios. Not unexpectedly, therefore, this volume is of some on-going interest to Australian as much as to Thai food policy analysts.

The research reported in this volume is the result of long-term professional and financial support from the Rockefeller Foundation to Thai food sector economists. The goal of the Rockefeller Foundation was to increase the capacity in Thailand to undertake socioeconomic policy analysis that is important for the future development of Thailand. A spin-off of this goal was the creation and development of a Food Policy Analysis Group, under the general leadership of the Secretary General of the Thai National Economic Development Board, Dr Snoh Unakul. The editor of the volume, Dr Theodore Panayotou, was an active partner in the project, working from his post as the Agricultural Development Council Associate in Thailand.

The papers in the volume are a fine testament to the work of the Food Policy Analysis Group, and to the important contribution that food policy analysis has to make to economic development of a food exporting economy.

Snoh Unakul begins his tribute to the papers in this volume with the following statement:

> 'While hunger as such is not a problem . . . malnutrition persists . . . increasing food surpluses does not necessarily mean . . . productivity has been rising . . . incomes . . . improving . . . exports tend to pull the domestic food prices to world price levels . . . it is not uncommon . . . for the consumers to pay high prices for food and the farmers to be receiving low prices, the large discrepancy being accounted for by high marketing costs and excessive marketing margins due to inefficiencies and market imperfections . . . we cannot claim that we always make the best of our export opportunities' (p. v).

This litany of food policy issues is examined in this volume in the context of Thailand. However, they are also issues relevant to Australia. As such, the supply and demand framework and food policy models outlined in the book for the analysis of food policy issues constitute a template that is of broad general interest, especially as a heuristic tool in the training of future food policy economists. It is in this respect that academic agricultural economists will find this volume most useful. However, for those also interested in details of the Thai food and food-export sectors, the volume also has much to offer as a source of data and parameter estimates, especially elasticities for use in supply and demand analysis.

The commodity focus of the papers presented covers rice, sugar, maize, tapioca and livestock (buffalo, cattle, swine and poultry). The analysis is essentially microeconomic, with special attention to producer and consumer responses to price changes. There is little in the way of integration of this micro analysis into the broader macroeconomic framework, in part because at the outset it was felt that 'reform of strictly agricultural policies such as commodity and input policies would be politically less disruptive and economically more beneficial to the food sector' (p.345).

However, just as the exchange rate upheavals of the 1980s, and the earlier inflation explosions of the late 1970s taught Australian farmers the importance of not seeing agriculture in a vacuum, so too Thailand found macro-policies have a critically powerful impact, even if indirect, on the food sector. If the early 1970s taught us the importance of food sector and commodity policies, the early 1980s demonstrated how easy it is to get these policies wrong if they are not seen in the broad macroeconomic context in which they have to operate. By underlining this lesson, this volume will prove a useful reference on food policy analysis for many years to come.

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What Price Farm Budgets? By L. R. MALCOLM and J. P. MAKEHAM. (Just Managing Press, North Melbourne, 1987.) Pp. 190, ISBN 0 7316 0007.

This is not just another book on farm budgets. The book is presented in an unusual way, using the dialogue technique. In the colloquy is 'Q', a sagacious questioning amateur person, and 'M&M', expressing the composite mind of Malcolm and Makeham, teachers in farm management.

The authors present the content in a candid and straightforward manner that will be understood by a broad cross-section of readers – professionals and non-specialists concerned with the business aspects of farming. These include accountants, bank managers, advisers, farmers, farm managers and students in farm management at universities and colleges. This is made possible by a discussion, essentially non-mathematical in content, together with realistic illustrations of typically asked questions regarding the practical hurdles encountered while constructing and utilising budgets for farm management decisions.

The authors have successfully marshalled much of the current wisdom regarding farm budgets derived from extensive experience and deliver it in a way that will bolster the reader's understanding of farm budgets.

The book is divided into four sessions. In the first session, 'Behind Farm Budgets', the authors explain the fundamentals of financial management and production economic rationale. In session two, 'Some Big Questions About Budgeting', the consequence of inflation, risk, and the practical implications of paying interest and opportunity cost are given attention. Approaches to account for these influences in budgeting and decision making are illustrated. The question of profit is considered from an accountant's and from an economist's perspective.

In session three, 'Tricky Issues In Doing Budgets' are considered. Vital arguments frequently misconstrued are ventilated. These include the concept of discounting, annuities, amortisation and depreciation. Assumptions concerning the life span of a project, its associated salvage value, and budgeting the economics of crop and pasture rotations are scrutinised. Taxation matters are discussed as they affect the numbers inserted in farm budgets, placing bias on strategies for increasing net of tax income.

In session four, 'Finally', M&M consider the usefulness of simple budgets for making farm management decisions, and the dichotomy between 'low' and 'high' theory techniques is well argued.

Most importantly, this is very much a 'What, Why, and How' book. It emphasises the practical points about budgeting for farm planning and analysis. Furthermore, it covers aspects of farm management decision making previously unexpressed in the printed form, but which are often implicit during college and university lectures. It is these attributes which will make it an indispensable support to available texts in farm management economics.

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