



Operations Research

Publication details, including instructions for authors and subscription information:
<http://pubsonline.informs.org>

The Analyst's Bookshelf

To cite this article:

(1973) The Analyst's Bookshelf. Operations Research 21(3):863-864. <https://doi.org/10.1287/opre.21.3.863>

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Review

JAY E. STRUM, *Introduction to Linear Programming*, Holden-Day, San Francisco, Cal., 1972, 404 pages.

THIS TEXT “develops linear programming with a minimum of prerequisites—in fact the only real prerequisite is the ability to read Chapter One, because little is assumed and the progression to new ideas is gradual.”

The following process is used: (1) tentative exploration of several areas, (2) more detailed scrutiny of the same topics, and (3) more sophisticated investigation. The discussions, often quite lucid, are reinforced by numerous illustrative examples.

The Simplex Method is developed in the first six chapters (135 pages). The “Corner-point Theorem” (if a LPP has a finite optimum, it is assumed at a corner) is made plausible in Chapter One with a diet problem and several production problems. The next two chapters motivate and present the algorithm first in 2-space, next in 3-space, and finally in n -space.

The fourth chapter introduces tableau notation, while the fifth shows how the calculations become more compact with a tableau. “Artificial Variables and Free Variables” are introduced in the sixth chapter. The tenth chapter (42 pages) takes up the (C^j-Z^j) form of the simplex algorithm and the relation between basic solutions and extreme points. It also contains the only serious mathematical error of the text; a basis is feasible if its convex CONE (not hull) contains the requirements vector (p. 248).

Sensitivity analysis precedes duality theory unlike in many texts. Multipliers are explored in Chapter Seven and utilized in the next chapter for post-optimality analysis. These are the finest chapters (51 pages) of the book and one of the best elementary treatments of which I am aware.

Chapter Nine (39 pages) is devoted to “Selected Applications”: approximation problems, the cutting stock problem, the knapsack problem, and the assignment and traveling-salesman problems. Both branch-and-bound and column generation techniques are touched upon.

Chapters Eleven and Twelve concern duality, condensed tableaux, and game theory (45 pages). The final and weakest chapter, Fifteen, gives a sketchy introduction to network theory and graphs (20 pages).

The remaining two chapters (70 pages) treat the transportation problem. First simple problems are posed and solved; an algorithm is slowly developed for perfectly balanced problems (i.e., balanced problems for which no partial row sum equals a partial column sum). Second, we learn how to find an initial basic feasible solution and overcome both degeneracy and unbalanced problems. It is shown that a multiperiod production problem may be placed in the transportation framework. Finally Dantzig's multiplier algorithm is presented as a culmination of the previous work.

The text has some minor shortcomings. A formal bibliography should supplement the eleven texts cited in footnotes. More answers to the exercises and an errata sheet should be prepared.

In conclusion, I can recommend the text for either an undergraduate or reading course in Elementary Linear Programming. Very little mathematical sophistication is demanded of the reader, yet the conscientious user should leave with a good appreciation of the subject's fundamental principles.

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Books Received

- R. C. AGARWAL AND E. O. HEADY, *Operations Research Methods for Agricultural Decisions*, Iowa State University Press, Ames, Iowa, 1973, 303 pages, \$10.95.
- O. BISCA, V. BOICESCU, V. E. CAZANESCU, M. CHERCIU, G. GEORGESCU, G. C. MOISIL, G. S. NADIU, I. PETRESCU, S. RUDEANU, C. SICOE, L. STATE, A. TEODORESCU, AND I. TOESCU, *Logique, Automatique, Informatique* (in French), Academie de la Republique Socialiste de Roumanie, Bucarest, Roumanie, 1971, 456 pages.
- JAMES R. BRIGHT AND MILTON E. F. SCHOEMAN, editors, *A Guide to Practical Technological Forecasting*, Prentice-Hall, Englewood Cliffs, N. J., 1973, 651 pages, \$49.95.
- MARVIN J. CETRON, HAROLD DAVIDSON, AND A. H. RUBENSTEIN, *Quantitative Decision-Aiding Techniques for R&D Management*. Gordon and Breach, New York, N.Y., 1972, 205 pages, \$14.50.
- A. ROSS ECKLER AND STEFAN A. BURR, *Mathematical Models of Target Coverage and Missile Allocation*, The Military Operations Research Society, 101 S. Whiting St., Alexandria, Va., 1972, 254 pages, \$7.50 (paper).
- LOUIS M. GOREUX AND ALAN S. MANNE, editors, *Multi-level Planning: Case Studies in Mexico*, North Holland/American Elsevier, New York, N.Y., 1973, 556 pages, \$35.00.
- H. KIENDL, *Suboptimale Regler mit Abschnittweise Linearer Struktur*, Springer-Verlag, New York, N.Y., 1972, 146 pages, \$5.10 (paper).
- JERRY M. MENDEL, *Discrete Techniques of Parameter Estimation—The Equation Error Formulation*, Marcel Dekker, Inc., New York, N.Y., 1973, 585 pages, \$19.50.
- F. POKROPP, *Aggregation von Produktionsfunktionen*, Springer-Verlag, New York, N.Y., 1972, 107 pages, \$5.10.
- LENNART RADE, *Thinning of Renewal Point Processes—A Flow Graph Study*, Matematisk Statistik AB, Gothenburg, Sweden, 1972, 178 pages, \$8.00 (paper).
- PATRICK RIVETT, *Principles of Model Building—The Construction of Models for Decision Analysis*, John Wiley & Sons, New York, N.Y., 1973, 141 pages, \$8.50.
- DAVID H. STIMSON AND RUTH H. STIMSON, *Operations Research in Hospitals*, Hospital Research and Educational Trust, Chicago, Ill., 1972, 110 pages, \$4.95 (paper).
- KENNETH WEBB AND HARRY HATRY, *Obtaining Citizen Feedback: The Application of Citizen Surveys to Local Government*, The Urban Institute, Washington, D.C., 1973, 105 pages, \$1.95 (paper).