and Correlation. The next chapter is on Deriving Solutions from Models, in which the author briefly mentions analytical and numerical methods, simulation, Monte Carlo Methods, statistical techniques, and operational gaming with its limitations. In Chapter 12 the author returns to optimization in experimental form, for example, through simulation. This is followed by chapters on Testing and Controlling the Model and Solution; on Implementation and Organization of Research, in which he points out that a solution, partly because of prestige of science, already involves the scientist as having made a recommendation; and finally on The Ideals of Science and Society: An Epilogue.

The wisdom of the author as a director of research scientists from different fields of specialization tremendously enriches the last two chapters. The book in its vastness should provide source material for evaluation of research and inspiration to those desiring a clear perspective of scientific activity.

T. L. Saaty

Office of Naval Research
Washington 25, D. C.

48[K, W].—Harvey M. Wagner, *Statistical Management of Inventory Systems*, John Wiley & Sons, Inc., New York, 1962, xiv + 235 p., 23 cm. Price $8.95.

Inventory models have probably been the subject of more mathematical analysis in the operations research literature than any other type of application, with the possible exception of queueing models.

In a well organized and cogently written monograph, the author has extended the mathematical analysis of the inventory problem to that of instituting appropriate management controls

The book is divided into four chapters. The first and smallest chapter provides an introductory framework for the main text. Chapter 2, by far the longest, is an excellent exposition of the (s, S) model. An (s, S) inventory policy is one which prescribes two numbers, s and S, which might be termed the reorder point and the maximum stock level. Specifically, if the stock on hand and on order has fallen to a level $x \leqq s$, then an amount $S - x$ is ordered to return to the level S. The purpose of Chapter 2 is to provide the mathematical tools to analyze control mechanisms.

Chapter 3 is the heart of the contribution made by the monograph. The author analyzes various statistical indices which may serve as controls for management. He contrasts barometer controls of the form $B = \theta$ (index number-target), where $\theta > 0$, with quota controls, which implies some limit on the index number itself. The barometer control implies a system of rewards and punishments based on the value of B. Quota control, as defined by Wagner, is dichotomous in the sense that if some limit were violated, it is presumed that the policy has not been followed.

A basis for the author's choice of the barometer control is consistency; which refers to the control system's encouragement given to the observance of the standards of an operating (s, S) policy. "A consistent control scheme is one in which the probability of exceeding the index limit is greater when violations of standards are present than when they are not." Chapter 4 extends the results of the previous chapter to cases where the distribution of demand varies.

The various chapters are fully illustrated by numerical examples, many of which are based on Monte Carlo runs of 10,000 periods of operation. The book is a worthy member of Wiley's publications in Operations Research.

JACK MOSHMAN

C.E.I.R., Inc.
Arlington, Virginia

49[L].—GARY D. BERNARD & AKIRA ISHIMARU, *Tables of the Anger and Lommel-Weber Functions*, Technical Report No. 53, AFCRL 796, University of Washington Press, Seattle, 1962, ix + 65 p., 28 cm. Price $2.00.

These important tables result from work on electromagnetic theory. They were computed on an IBM 709 at the Pacific Northwest Research Computing Laboratory of the University of Washington, with support from the Boeing Company, Seattle and the Air Force Cambridge Research Laboratories, Bedford, Mass. The functions tabulated are the Anger functions.

$$J_\nu(x) = \frac{1}{\pi}\int_0^\pi \cos(\nu\theta - x\sin\theta)\,d\theta$$

and the Lommel-Weber functions

$$E_\nu(x) = \frac{1}{\pi}\int_0^\pi \sin(\nu\theta - x\sin\theta)\,d\theta.$$

When ν is an integer n, the Anger function reduces to the Bessel function $J_n(x)$.

Both functions are tabulated to 5D, without differences, for $\nu = -10(0.1)10$, $x = 0(0.1)10$. Tables for negative x are unnecessary, since changing the sign of both ν and x leaves J unchanged and merely changes the sign of E. There are graphs of both functions against ν and contour maps of both functions in the (ν, x) plane. An appendix contains an IBM 709 FORTRAN program for computing the functions.

Previous tables of the Anger functions (other than the Bessel functions for integral ν) are exceedingly slight. Rather more has been done on the Lommel-Weber functions; see FMRC *Index* [1]. The concise and handy tables of Bernard and Ishimaru now establish both functions firmly in the repertoire of numerically available functions.

Precision is stated to be ± 1 in about the last (fifth) decimal place. If this is taken to mean that the tabular values are always within about one final unit of the true values, the statement appears to be true, but does less than justice to the accuracy of the tables. With perfect rounding of the normal kind, tabular values lie within half a final unit of the true values, and it might be thought that the distribution of the rounding errors in the present tables has twice the perfect scatter. As far as one can judge, this is not so.

Only a small fraction of the tabular values can be compared with values already available, but the chief comparisons which are possible have been carried out by the reviewer, in order to test his hypothesis that the vast majority of the tabular values for $\nu \geqq -\frac{1}{2}$ are correctly rounded according to a different convention. This is that positive values are rounded upwards, and negative values are rounded (numerically) downwards; in other words, that in both cases the tabular values