

Some Comments on Management Science in Banking

By KALMAN J. COHEN*)

It has been gratifying, during this year in Europe, to observe the tremendous interest that exists here in applying Management Science techniques to the problems of banking. It is even more heartening to find that some leading European banks have already begun developing Management Science projects and, in a few cases, successfully implementing them. As might be expected, most of the early Management Science projects done by banks in Europe have adapted some of the available American models to European problems. It is important to note, however, that some pioneering work is being done in formulating new models that are more appropriate to European banking problems than are existing American models. The date is not far off, I predict, when some new Management Science techniques will be developed in Europe, and later applied by American banks.

The new tools provided by Management Science will enable bankers to increase the efficiency of both management and operations in their banks. This will permit banks to offer newer and better services to their customers, while at the same time achieving higher levels of bank profitability and safety. To encourage bankers to adopt these improved techniques has been the major concern of my professional activities in this area.

In order to introduce the reader to the available literature in bank Management Science, I would like to discuss the following topics: a definition of "Management Science"; the essential professional nature of bank Management Science; a review of the extent to which Management Science activities in American banks have flourished during the past two years;

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and, as an Appendix, some bibliographical notes on recently available material.

What Is "Management Science"?

At the outset, a brief definition of Management Science may be useful. I like to define "Management Science" as *the application of quantitative techniques and scientific concepts to help executives solve the planning, decision making, and control problems of large, complex organizations.* Note that according to this definition, Management Science is intended "to help executives," and not to replace executives.

Electronic computers are often involved in the development and implementation of Management Science projects. When utilized properly, computers should function as *aids* to bank executives, in the same way as do telephones, dictating machines, and jet airplanes. None of these mechanical or electrical devices in any sense "replace" managers, but by taking advantage of them, today's bank executives do much more effective jobs of planning, decision making, and control than did their predecessors a few generations ago.

Most modern bankers now appreciate the ways in which electronic computers can be used to process magnetic-ink-encoded checks and to perform routine bookkeeping operations. Comparatively few bankers realize, however, that the ultimate pay-off from applying computers in banking will come from utilizing computers as aids to bank executives, rather than for clearing checks more quickly or replacing clerks. When bankers learn to exploit the great potential that computers have to offer them, then it will become commonplace for bankers to interact with computers and with the Management Science models programmed inside the computers. The result will be "managers *with* computers" rather than, as some critics fear, "management *by* computers."

The Need for Professionalism in Bank Management Science

In order to insure continued development and widespread application of Management Science techniques to banking problems in Europe, it will be necessary for these efforts to take place in an appropriate professional atmosphere. In particular, both the executives and the Management Scientists who work on planning, decision making and control problems in European banks should be free to publish detailed descriptions of their models and appraisals of the results that have been obtained from attempts to implement them. This is the pattern that my associates and I at Bankers Trust Company have done our best to establish, and it has been

accepted as being appropriate at some (but, unfortunately, not at all) other American banks as well. I strongly feel that the free interchange of ideas on a professional basis is essential if Management Science applications in banking are to flourish.

In urging this atmosphere of professionalism, I am not necessarily appealing to the altruism of bankers. Indeed, the self-interest of a bank will be furthered when it creates this type of professional atmosphere. By doing so each bank will have access to and better development with respect to Management Science models and techniques that were developed outside of its own narrow institutional confines. A bank which establishes the type of intellectual atmosphere in which competent young Management Scientists are eager to work will also have an important recruiting advantage. Furthermore, a bank that develops a reputation as a leader in the field of Management Science can expect many types of new and improved business benefits to accrue, for both corporate and correspondent bank customers will bring a larger share of their business to a progressive and innovative bank. Finally, the only real way in which the executives of a bank can be assured that their Management Science staff is applying the most modern and appropriate Management Science techniques is to expose these Management Scientists to professional criticism by competent workers in the field. Since ordinary bankers are not themselves in a position to assess the degree of professional competence employed by their own Management Scientists, it is only the external profession that can provide the desired type of "quality control" checks. In order for the profession to be able to do so, however, it is essential that the internal Management Science developments at a bank be made public knowledge through the presentation and publication of appropriate articles, papers, and books.

Management Science in American Banks During the Past Two Years

Two years ago *Analytical Methods in Banking* was published.* Thus it is timely to review the reasons that Dr. Hammer and I edited the book and to comment upon the extent to which our hopes have been fulfilled.

First, we had hoped to increase the appreciation and understanding of analytical methods by bankers and by students in banking. I feel very encouraged by developments in this respect during the past two years. The extent to which *Analytical Methods in Banking* has been adopted as a textbook in courses given in universities and banking schools has been rewarding. Furthermore, many sessions at meetings of professional societies (such

*) Kalman J. Cohen and Frederick S. Hammer, Editors, *Analytical Methods in Banking* (Homewood, Illinois: Richard D. Irwin, Inc., 1966).

as The Institute of Management Science and The Operations Research Society of America) are being devoted to banking applications of analytical techniques. Finally numerous short courses on Management Science are now being given to bankers in the United States.

Our second hope was that a growing number of banks would apply Management Science techniques to improve the efficiency and profitability of their operations. Some information about the extent of progress toward this goal can be obtained from a recent survey of Management Science applications in American banks that has been conducted by an American bank trade association, NABAC (The Association for Bank Audit, Control, and Operations*). There are forty-five different banks in the United States of America that claim to have at least one person working on Management Science applications. Of course the magnitude of the Management Science efforts at these forty-five banks varies widely. Twenty-two of these banks employ only one or two persons in this area, with these people sometimes devoting only part of their time to Management Science. At the other extreme are ten banks whose Management Science groups consist of at least seven people. The most active banks are undoubtedly Bankers Trust Company and Chase Manhattan Bank. These New York banks indicated at the May, 1967 *Automation Conference* of the American Bankers Association that their annual budgets for Management Science in 1967 approximated \$700,000 for Bankers Trust and \$600,000 for Chase Manhattan; each of these banks also employed approximately thirty people in its Management Science group. The NABAC survey also contains interesting information about the application areas of Management Science techniques in American banks. The results indicate that not only have projects been undertaken in all of the areas represented by the papers in *Analytical Methods in Banking*, but that there are many additional areas of banking applications where Management Science techniques have been applied. Unfortunately, published material does not yet exist for all these applications.

Our third aim in editing the book was to stimulate the further development of new analytical tools and models for banking problems. There also our hopes have been fulfilled in a satisfactory manner. More details concerning this appear below in the Appendix.

In the past two years, a tremendous interest has been spurred within American banks in the utilization of Management Science techniques. This awareness has caught fire in Europe, and the next two years should show

*) 1967 NABAC Bank Automation Directory (Park Ridge, Illinois: NABAC, 1967), pp. 34-43.

dramatic accomplishments. But, in the final analysis, it is not simply a desire to support scientific research which will convince the bankers. It is, rather, the impact of these new techniques on bank growth and profitability. The potential of Management Science in banking is great. The realization will ultimately be reflected on the financial statements of these banks which properly exploit it.

APPENDIX

I would like to supplement the above comments and the articles compiled in *Analytical Methods in Banking* by a more recent selection of material that has become available only within the last two years. This is by no means a final bibliography, but it will show, I hope, the accelerating rate of publication in this creative and dynamic area. As a convenience to the reader familiar with *Analytical Methods in Banking*, these additional references are grouped according to the six Parts of the book.

Part I. Introduction

The following papers are relevant to the material contained in Part I.

First, there is a series of six papers written by Dr. Frederick S. Hammer on "Management Science in Banking" that appeared in the *Bankers Monthly Magazine* during 1966 and 1967. The titles and publication for these articles are as follows:

- (1) "Management Science: A Tool for Bank Management," August 15, 1966.
- (2) "Management Science: Characteristics and Methodology," September 15, 1966 (co-authored by Robert L. Kramer).
- (3) "Banking Applications of Management Science (1)," November 15, 1966.
- (4) "Banking Applications of Management Science (II)," January 15, 1967.
- (5) "Managing Management Science," February 15, 1967.
- (6) "Management Science: Its Future in Banking," May 15, 1967.

A brief review of the scope and impending difficulties to be resolved in banking research is contained in a talk presented by Dr. Frederick S. Hammer at the Annual Meeting of the Operations Research Society of America in June 1967: "Research in Banking: Scope, Problems and Prospects."*)

*) Copies may be obtained by writing to Dr. Frederick S. Hammer, Director, Division of Research, Federal Deposit Insurance Corporation, 550 17th Street, N. W., Washington, D. C. 20429, U. S. A.

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Part II. Asset Management

The following papers are relevant to the material contained in Part II. Alexander A. Robichek, Charles W. Haley, and W. David Niebuhr, *Stanford Bank Management Simulator* (Stanford, California: Graduate School of Business, Stanford University, 1966).

Kalman J. Cohen and Frederick S. Hammer, "Linear Programming and Optimal Bank Asset Management Decisions," *Journal of Finance*, Vol. 22, No. 2 (May, 1967), pp. 147-165.

Kalman J. Cohen, Frederick S. Hammer, and Howard M. Schneider, "Harnessing Computers for Bank Asset Management," *The Bankers Magazine*, Vol. 150, No. 3 (Summer, 1967), pp. 72-80.

Kalman J. Cohen and J. Timothy Heames, "FDIC Bank Management Simulation." *Proceedings of the 22 nd National Conference, Association for Computing Machinery*, Thompson Book Company, Washington, D. C., 1967, pp. 195-202.

Part III. Lending and Credit Functions

The following papers are relevant to the material contained in Part III.

H. Martin Weingartner, "Concepts and Utilization of Credit-Scoring Techniques," *Banking*, Vol. 58, No. 8 (February, 1966), pp. 51-53.

William P. Boggess, "Screen-test Your Credit Risks," *Harvard Business Review*, Vol. 45, no. 6 (November-December, 1967), pp. 113-122.

Part IV. Trust Department

The following papers are relevant to the material contained in Part IV.

Jack L. Treynor and Kay K. Mazury, "Can Mutual Funds Outguess the Market?" *Harvard Business Review*, Vol. 44, No. 4 (July-August, 1966), pp. 131-136.

William F. Sharpe, "A Linear Programming Algorithm for Mutual Fund Portfolio Selection," *Management Science*, Series A. Vol. 13, No. 7 (March, 1967), pp. 499-510.

Kalman J. Cohen and Jerry A. Pogue, "An Empirical Evaluation of Alternative Portfolio Selection Models," *Journal of Business*, Vol. 40, No. 2 (April, 1967), pp. 166-193.

Kalman J. Cohen and Edwin J. Elton, "Inter-Temporal Portfolio Analysis Based on Simulation of Joint Returns," *Management Science*, Series A, Vol. 14, No. 1 (September, 1967), pp. 5-18.

Jerry A. Pogue, "An Adaptive Model for Investment Management,"

presented at the Annual Meeting of the Operations Research Society of America, June 1967.*)

Keith V. Smith, "A Transition Model for Portfolio Revision," *Journal of Finance*, Vol. 22, No. 3 (September, 1967), pp. 425-439.

Kalman J. Cohen and Jerry A. Pogue, "Some Comments Concerning Mutual Funds Vs. Random Portfolio Performance," *Journal of Business*, Vol. 41, No. 2 (April, 1968), in press.

Kalman J. Cohen, Joel Dean, David Durand, Lawrence Fisher, Eli Shapiro, and James H. Lorie (Chairman), *A Set of Measurements for Evaluating the Management of Pension Funds*, A Report to NABAC by its Special Committee on the Evaluation of Pension Fund Management, (Park Ridge, Illinois: NABAC, in press).

Part V. Bond Department

The following papers are relevant to the material contained in Part V.

Kalman J. Cohen and Frederick S. Hammer, "Optimal Level Debt Schedules for Municipal Bonds," *Management Science*, Series A, Vol. 13, No. 3 (November, 1966), pp. 161-166.

Optimum Bond Bidding, User's Manual, IBM Application Program (360A-FI-06X), International Business Machines Corporation, 1966.

Part VI. Other Banking Problems

Robert L. Kramer, "Analysis of Lock Box Locations," *Bankers Monthly*, May 15, 1966.

E. Eugene Carter and Kalman J. Cohen, "The Use of Simulation in Selecting Branch Banks," *Industrial Management Review*, Vol. 8, No. 2 (Spring, 1967), pp. 55-69.

The NABAC Proof and Transit Simulation Model (Park Ridge, Illinois: NABAC, 1967).

Robert L. Kramer, "A Model of Consumer Banking Behavior," presented at the Annual Meeting of the Operations Research Society of America, New York, June, 1967.**)

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**) Copies may be obtained by writing to Mr. Robert L. Kramer, Assistant Vice president, Methods Research Department, Bankers Trust Company, 16 Wall Street, New York 10015, U. S. A.