

REVIEWS

Principles of Finance and Investment. By LEWIS G. WHYTE, F.F.A.

[Cambridge: Published for the Institute of Actuaries and the Faculty of Actuaries at the University Press, in two volumes. Vol. I, pp. xi+192, 1949. 12s. 6d. Vol. II, pp. vii+176, 1950. 12s. 6d.]

MR LEWIS WHYTE was asked to prepare a text-book for the financial and investment sections of the examinations of the Institute of Actuaries and the Faculty of Actuaries. The difficulty of this task may be appreciated when it is realized that it has never been possible, and probably never will be possible, to define with precision the scope which is meant to be covered under this heading, particularly now that the Institute has adopted a new and, as yet, untested syllabus. Adjured to steer a course between the Scylla of attempting too much and the Charybdis of achieving too little, the author has reached harbour with these two volumes. Necessarily the work covers a very wide field; necessarily some sections are dealt with in some detail; inevitably the reader will think of many more details which might have been added, and of some sections that might with advantage have been expanded. This merely emphasizes the difficulties of the problem which the author has tackled, and the necessity that faced him of pruning his subject matter to keep the work within reasonable lengths, particularly from the point of view of the student preparing for the examinations.

In all this the author has been eminently successful. The student, new to the subject, will find an introduction to the investment world, the practising actuary an insight into the problems of his investment colleagues, and those whose business it is to handle the investments of large funds will certainly not be unrewarded for the time spent in reading this work.

The student, in fact, may offer criticism that the first volume in particular introduces a vast field of subject matter, leaving the reader with a feeling of his own colossal ignorance which could not possibly be remedied without recourse to a substantial volume of reading outside the book. This is, of course, true, but in the short space available no author could do more and very few could have achieved such a wide vista so clearly.

The first volume can be conveniently considered under the three headings—economics, investments and national finances. Four chapters are devoted to the subject of economics and in the space available it is clear that the treatment must be elementary and confined to those matters germane to financial questions. Wealth, Money, Interest, Profit are dealt with briefly and mention is made of the Laws of Supply and Demand, the Theory of Variable Returns, Inflation and Deflation, and Savings and Investment. The subject is reinforced with a brief historical survey of the main economic factors that prevailed in the period since 1800 but, where space for the subject has to be so limited, it seems a pity that the author found it necessary to make Chapter 10 so repetitive of the historical matter included in Chapter 2.

The author must have considered carefully the extent to which space should be found for the problems of international trade and the relationship between currencies. Apart from a short reference to the International Monetary Fund he has evidently concluded that the subject would be better omitted rather than be

given too brief a mention. Some readers will feel that, although the Gold Standard has many imperfections, an examination of the rules and methods involved in its workings yields many valuable lessons to students which would have justified its inclusion together with a survey of more modern lines of attack. These chapters on economics conclude by contrasting the conceptions of 'laissez-faire' and 'democratic planning' and, although first experience of students shows that they tend to regard the former as wholly bad and the latter as a panacea for all ills, these opinions cannot be blamed on Mr Whyte who is careful to point out the advantages and disadvantages of each. I cannot resist the temptation to quote a passage from the author's survey of the period 1846-1914.

Indeed, few people then worried much about the economic state of the nation. They (were) too busy getting on with their own particular jobs.

The chapters devoted to investments are six in number and begin with a brief but thorough examination of all forms of association for business purposes with particular emphasis on the limited-liability company and the main rules governing its behaviour. Separate chapters are devoted to investment in contractual obligations and by way of proprietary interests. Criticisms of either of them would be of a minor nature only. For instance, a stronger lead might well have been given on the desirability of giving to preference shares a voice in the determination of the borrowing powers of the company and, although the use of similes is frequently employed to emphasize an argument, it is to be hoped that the comparison of preference shares and ration books will lose its topicality long before the book outlives its purpose.

Excellent chapters are included on the operations of the stock exchange and on the analysis of company accounts. I feel that it would have been helpful in the former chapter to have gathered together in one place and contrasted the various ways in which new issues can be introduced to the market.

The reference to issuing houses does not give adequate credit to their value to the investor. The best issuing houses such as the merchant banks will not sponsor an issue unless they are themselves satisfied with the integrity, stability and prospects of the company concerned. Further, their interest in the issue does not cease with the receipt of their underwriting commission. They are prepared, and expect, to assist the investor at any subsequent time when action may be needed to protect his interests. It would have been instructive had the author seen fit to give an exposition of the theory and justification of underwriting. The commissions paid are frequently criticized after an issue has been successful—although attention should be concentrated on the earlier date at which the underwriter accepts his commitment. The uncertainties of the market and the whim of the investor are then much more obvious, particularly at the present time of recurrent international crisis.

The other chapter on investments is devoted to the general principles governing the selection of individual investments, and rightly directs the main attention to the necessity of asking the right questions.

The two chapters on national finance comprise a useful summary of the fiscal methods by which public moneys are raised and expended, and a discussion of the way in which the state of the national economy is assessed from a study of statistics and national-income accounts. This second chapter was designed to be read in conjunction with the White Paper on the National Income, and other official documents, and it is unfortunate that the White Paper has now undergone

sufficiently large changes in presentation to make this part of the book lose some of its value.

A distinct shortcoming which applies to both volumes is the lack of a glossary—even more so because the author has been careful to introduce in their proper context most of the commonly-used financial terms and to explain their meanings.

The second volume opens with chapters on the money market and banks where the author demonstrates his power of effective summary in his review of the Bank of England and the clearing banks; he explains the various items that appear in their accounts and the main features of their policy and practice. Brief notes are also included on the discount houses and other members of the money market and on the activities of the merchant banks and overseas banks. The chapter closes with a note on credit control. It comes as a surprise to find that the workings of the Bank of England have been described without mention of the Bank Rate (it gets a short mention in the following chapter) or of the activities of the special buyer and the terms direct and indirect assistance; this must be a disadvantage to the student who tries to follow the daily financial news. The paragraph on credit control aims to avoid confusion by not going too deeply into the detailed mechanics of the subject, and possibly errs on the other side by being too general.

The study of factors influencing the rate of interest is a subject so wide that nothing more than an indication of the main heads can be given. It is a valuable feature of this chapter that the years since 1918 have been examined in the six periods in which the rate of interest showed definite and distinguishable trends so that the reader can draw further conclusions of his own.

The chapters dealing with the main types of stock exchange securities begin with a comprehensive study of gilt-edged stocks and include a short note on taxation. For those who prefer diagrammatic methods of absorbing information, two large charts are provided in a pocket at the end of the book, one showing details of issues of government stocks since 1918 and the other, by a skilful arrangement of securities, the fields in which different owners of these stocks tend to operate. It seems likely that, in practice, the insurance companies differ from the indications in this diagram by having greater weight on the long-term dated stocks than on irredeemables. This chapter has a paragraph on switching—which does not refer to methods of comparing stocks of different dates by means such as the calculation of a yield for the balance of the term—and closes with notes on guaranteed stocks, municipal issues and the obligations of public authorities in the Dominions.

After a chapter on foreign government securities the author provides valuable studies of loan capital, preference and equity stocks, which give most of the information likely to be required under these headings. Worthy of special mention are the author's notes on debenture stocks, on the problem of winding-up or reduction of capital as applied to preference shares and on the correct approach to the evaluation of equity shares. In connexion with loan capital, a longer note on that stumbling block for students, the floating charge, would have been helpful. In the chapter on equities a lead from the author on the question of bonus issues, to put them in proper perspective, would have been welcome.

These chapters are followed by an able examination of the problems involved in making property investments, with a section devoted to the special features that arise in Scotland. The different forms of these investments are dealt with, as are the various classes of property that may come up for consideration. Sections are included on the Rent Restrictions Acts and Town and Country

Planning Acts and on the methods by which investments of this type are acquired.

There will be general agreement that the main principle of life-office investment policy must be to ensure that maturing contracts are duly met and that other considerations are subordinate to this end, but there is divergence of opinion in the actuarial profession with regard to the best way of putting this principle into effect. One of the chief difficulties is to determine the most suitable arrangement of the portfolio between stocks of different maturities. The author's approach is to examine the progress of the fund on different assumptions as to the level of future business, but no mention is made of other methods. There will be few criticisms of his chapter on the management of a life office's portfolio which is dealt with under the five headings—the technique of making purchases and sales, the analysis of holdings, supervision and gathering of information, the treatment of income and, finally, valuation. This last heading also provides topics for discussion among actuaries, but Mr Whyte has commendably suppressed the bias which he probably feels towards his own method and has given a very fair account of the main questions at issue.

In the final chapter the author reviews the role of institutional investors in the national economy, pointing out the valuable function they perform in the financial well-being of the community. He refers to the ill effects that might arise from any interference with the offices' ability to exercise their unfettered judgment on investments. To those who might wish so to interfere, I would prescribe Mr Whyte's book—it should give them pause and make them think again.

L. B.

British Government Securities in the Twentieth Century. By PEMBER and BOYLE.

[Second edition, 1950. Printed for private circulation. Not for sale.]

MEMBERS of the Stock Exchange fulfil two main functions. The first is to transact business, as broker or jobber, on the floor of the House. The second is to serve their clientele in the capacity of statisticians, analysts, chroniclers and professional advisers. The latter function has expanded greatly in recent years, and this work by Messrs Pember and Boyle stands out prominently as a shining example. It is an enlargement of an earlier edition and comprises nearly 600 pages. It has been prepared not only with skill and assiduity but also—as any reader must imagine—with an ardent devotion to the task. The result is a sumptuously produced volume, a treasure for the financial community and a credit to the Stock Exchange profession.

There are six sections. The first is a record of British Government securities quoted on the London Stock Exchange in each year of the present century. Then follows a fascinating history of the Government debt since 1694. As would be expected, the big increases in the national debt were caused almost entirely by wars. But peace had its reward and between 1818 and 1899 the debt was reduced from around £800 million to £585 million.

Next follows an analysis of the debt during each year of the present century, analysed according to maturity, domicile and market. Perhaps the most interesting feature here is that in 1900 'Securities not quoted on the London Stock Exchange' accounted for 15.68 % of the total; in 1949 the percentage had increased to

50.69 %, reflecting the enormous increase in Treasury Bills, T.D.R.'s, National Savings Certificates, etc. Surely the significance of this is that Treasury control of money rates must remain strongly entrenched.

Section 4 contains an analysis of the published holdings of the National Debt Commissioners, which body has not met as a whole since 1860. The percentage of quoted securities now in the hands of the public departments is over 15 %, and in the case of 2½ % Treasury Stock it is over 52 %. But although, as the authors say, the Old Lady of Threadneedle Street has been made 'an honest woman', an opaque purdah still cloaks the operations of the Issue Department of the Bank.

Section 5 is a miscellany, and the last section contains charts 'for the convenience of addicts and abstainers alike'. Those who are neither, but who are merely temperate, will no doubt study the charts headed 'The Investors' Reward', 'Taxation' and 'Death Duties' with the deep seriousness and attention which they deserve.

This work, a copy of which has been presented to the Institute Library, will surely win the warmest admiration of fellow statisticians and in particular of actuaries.

L. G. W.

Economic Survey 1919-39. By PROFESSOR W. ARTHUR LEWIS.

[Pp. 221. George Allen and Unwin Ltd. 15s.]

THE origin of this book was a course of lectures given to students of the London School of Economics in 1944-47. The survey is three-dimensional. First, it deals with the inter-war period in chronological order. Secondly, it views the period in turn through the eyes of Great Britain, U.S.A., Germany, France, Japan and Soviet Russia. Thirdly, it concerns itself with the trends of economic thought and action.

Prof. Lewis explains that the general purpose of the book is 'to collect the necessary facts together with theory in the background rather than on the centre of the stage'. The result is a perfect blend of fact and theory, of evidence and judgment. To compress the economic history of those fateful twenty years into 200 pages of easily readable material—without giving the reader the impression of being taken on a whirlwind tour—is a great achievement. The survey is commendably objective and the author has resisted any temptation to over-emphasize special aspects in order to press home his own theories and deductions.

The purpose of a historical survey such as this is twofold: first, to inform the reader with regard to events, and secondly, to seek out reasons and to examine consequences in the hope that the present and the future will benefit from the lessons of the past. The general verdict is that on the whole the world is managing its economic affairs rather better today than it did during the inter-war period; benefit is in fact being derived from the lessons of the past.

While not referring openly to Keynes's provocative work, Prof. Lewis demonstrates very clearly the economic consequences of the Peace Treaties. The handicaps imposed upon trade by the disintegration of the Austro-Hungarian Empire, the crippling effects of war debts and reparations, the withdrawal of Russia from the comity of European nations—all these impediments are given due prominence, but time and time again Prof. Lewis drives home to the

reader the disastrous results which were caused by injudicious currency and monetary decisions.

Practically every great nation at some time or another was guilty of striving stubbornly to establish or to maintain unrealistic rates of exchange, to the detriment of themselves and their neighbours. Those who were responsible for monetary decisions were usually haunted by fears of past ills instead of being guided by the circumstances of the times. For instance the point is made that, if credit conditions in Germany had only been tighter before 1923 and easier after 1928, Hitler's rise to power might never have succeeded.

The deepest malady of all, largely independent of the consequences of the first world war, was the failure of demand for primary products to keep pace with the production of manufactures. Increased tariffs, in the author's opinion, were less damaging than was generally thought to be the case. The importance of currency and monetary policy is emphasized, restriction schemes and stabilization schemes (of primary products) are supported, the stubbornness of governments in trying to maintain fictitious price levels is condemned, yet it is somewhat surprising that the author virtually ignores that interesting and quite successful experiment in currency exchange management during the late thirties, namely the operation of the Exchange Equalization accounts.

Prof. Lewis in his chapter on the United Kingdom says that 'Ideas are always behind the events which generate them'. In this valuable and stimulating work that is one gap which he has assuredly helped to narrow.

L. G. W.

The Principles of Economic Planning. By PROFESSOR W. ARTHUR LEWIS.

[Pp. 128, Dennis Dobson Ltd. 8s. 6d.]

THIS is a study prepared for the Fabian Society. It is fundamentally different from the book by the same author reviewed above. Now theory takes the centre of the stage; facts are in the background. The need to plan, in the author's opinion, is no longer open to debate. He says 'The truth is that we are all planners now'. But are we all prepared to be planned? Prof. Lewis perhaps takes that too much for granted. But, ardent planner though he appears to be, he is genuinely seeking the ideal of planning with the consent of the planned.

Some call this democratic planning—a convenient and inarticulate catchword of which no one quite knows the full meaning. But whatever its precise definition its nature is antithesis rather than synthesis. Herein lies the problem. How does Prof. Lewis attempt to solve it? In the first place, he discusses the two main forms of planning: planning by direction, and planning by inducement. He argues strongly in favour of the latter and for using the price mechanism as a primary instrument. It is indeed refreshing to read such words as 'The future of the country depends on bold and free *entrepreneurship*'.

Secondly, he emphasizes the importance of Government planning of investment and saving. All political parties would agree with this. If the direction of planning is to increase the current level, then it is to be done by means of inducement. But if in the other direction, planning by inducement in such context usually involves dearer money. Here the solution of one problem usually creates new ones and so some form of planning by direction is thought to be necessary.

There are several occasions on which the reader may feel inclined to pose the

question: What does the author believe to be the primary purpose of planning? Is it the creation of wealth, or the distribution of wealth? He is too good a socialist not to support the latter, he is too good an economist to forget the former. But here again antithesis intrudes, and the reader is left with the impression that the solvent is not solely in the hands of the planner.

Of particular interest is the chapter on nationalization, the opening words of which are 'The nationalization of industry is not essential to planning'. Compensation, Prof. Lewis says, should be fair and should err on the generous side. For, as he continues, it should then be siphoned off later in death duties and capital levies. No wonder the virtues of thrift are not extolled here! The idea of partial nationalization finds favour in the author's eye and he advocates a greater degree of decentralization of the nationalized industries.

On the difficult subjects of wages and mobility of labour Prof. Lewis concedes that his proposals are likely to meet with serious practical difficulties. He would like to see wages subject to central control but admits that the prerequisite, which is 'to concentrate on the educational job of getting the rank and file to understand why' will take a very long time to achieve.

The book is undoubtedly a stimulating and sincere piece of work. The subject matter is, however, still in the speculative and experimental stage of development. It is no discredit to the author to say that the reader should therefore approach the study with a critical eye and should not take too much for granted. He is entitled to take this line, for after all he is one of the 'planned'.

L. G. W.

Modern Life Insurance. By ROBERT I. MEHR, Ph.D. and ROBERT W. OSLER.

[Pp. xii + 769. The Macmillan Company, New York, 1949. 37s. 6d.]

THE authors have set themselves the task of writing a basic text-book for the life insurance courses given in American Colleges, and have tried to arouse the interest of the young student by writing in colloquial style. The result is something quite different from the discussion of the theory and practice of life insurance normally found in the United Kingdom.

The book is divided into six parts dealing with: Introduction (the bases of insurance); The Product (types of insurance); The Cost (selection of risks, calculation of premiums and finance); The Market (individual, family, business, estate and taxation needs); Life Insurance Business (types of company and organization); The Life Insurance Industry (size and scope, development, regulation, social values and glossary of life insurance terms). The glossary is a helpful addition for the uninitiated and will assist the English reader with a knowledge of insurance to familiarize himself with American terminology, though actuarial readers may be somewhat surprised to find on looking at the definition of an actuary that '... The term is more frequent in the United States than in other countries, in which such a person is usually called the company "mathematician"'. In an appendix at the end of the book are a specimen policy, proposal form and agent's contract.

The main feature of the book is the emphasis placed on the uses of life insurance and, although it can hardly be regarded as a serious text-book in the accepted sense, it nevertheless contains a large amount of useful general information on American practice in very readable form. The matter is non-technical and principles are explained in a straightforward manner. There is a full and interesting

discussion of the practical applications of theory from the view-point of the buyer and of the salesman of insurance, but pure theory is kept to a minimum and the authors have included practical details only to the extent necessary to give a picture of the industry as a whole.

Being written for American students, the book deals solely with American life insurance practice and it can be thoroughly recommended to any English insurance student who wishes to acquire a general knowledge of American methods. In particular, the section on 'The Market' dealing with the various needs for insurance throws an interesting light on American methods of 'selling insurance' and their logical and thorough approach to the problem of estimating the insurance needs of the individual.

B. R.

Actuarial Statistics. Vol. 1. *Statistics and Graduation*. By H. TETLEY, M.A., F.I.A. (Co-ordinating Editor, H. FREEMAN, M.A., F.I.A.)

[2nd edition. Pp. xvi+285. Cambridge University Press, 1950. 21s.]

THE first edition of this work was reviewed in *J.I.A.* LXXIII, 173. The new edition follows the original with only minor variations. There is a short section on the Poisson distribution which, as the author points out, is of special applicability in actuarial work where probabilities may be very small and numbers exposed to risk very large; it is shown how this distribution can be derived from the binomial. In the chapter on sampling a reference is made to the notion of biased and unbiased estimates, and in some places there is a slight change of emphasis, as in section 23 on amalgamation of samples.

The alteration in the wording in Example 1, p. 133, is confusing, suggesting that a certain adjustment should be made whereas in the subsequent working this is not done. This could have been remedied by punctuation, which is also at fault in line 4 of section 20, p. 243. In general, however, the errors of the previous edition have been corrected and the book is excellently produced (on improved quality paper).

E. C. E.

The Statistical Approach. By M. G. KENDALL.

[Inaugural Lecture given at the London School of Economics, 17 January 1950,

Pp. 19. Reprinted from *Economica* XVII, 127.]

IT is a valuable and stimulating experience for any scientist to 'stand back' from his subject and to contemplate it as a whole particularly in relation to other fields of intellectual activity with which it has a close affinity, or which overlap its domain at some point. Particularly does this apply to the science of statistics which has developed so rapidly during the first half of this century and in which the perfection of different techniques for dealing with special problems has tended to concentrate attention on the outlying fringes of the subject.

Prof. Kendall has performed a real service therefore in seizing the opportunity afforded by his inaugural lecture to examine the whole range of the statistical approach and to assess its true place in the modern world. He claims, in fact, that the statistician, in spite of his inevitable preoccupation with counting or measuring what he observes, 'has a unified conception of the world at large, that he derives from his science a satisfaction of those desires for a grasp of the

fundamentals of things which lies beyond pure reason—in short, that he has a philosophy’.

After surveying the vast range of subjects in the study of which the methods of statistical analysis now play an important part, Prof. Kendall mentions some interesting examples of how techniques developed for one type of problem are being used for very different purposes; how, for instance, Karl Pearson’s work on the spread of mosquitoes under random migration from a malarial site is applied to the spread of disease, the diffusion of gases and the molecular structure of rubber; and how Whitworth’s ‘text-book’ problem on the distribution of the size of pieces of a stick broken at random provided the theoretical results needed in the design of traffic lights, the study of bomb fragmentation, the detection of trade cycles and the analysis of noise.

The distinguishing characteristic of the statistical approach is that it deals with aggregates and investigates group properties. This is a source of strength in that most, if not all, natural laws are group properties, but it is salutary to be reminded in this lecture that, when individuals are grouped, some information is inevitably lost in the process. This is not a serious weakness however in dealing with natural phenomena since nature seems to rely for the survival of a species on sheer weight of numbers. As a further example of the way in which nature seems to be conceived on a statistical basis Prof. Kendall instances the second law of thermodynamics, usually regarded as one of the most fundamental of all physical laws, which states that the ‘organization’ or ‘orderliness’ of matter and energy is constantly being dissipated so that the universe is steadily becoming more and more random or ‘unorganized’.

The section dealing with the relationship between the statistician and the mathematician will be cordially endorsed by most actuaries. It is pointed out that statistics is *not* a branch of mathematics, pure or applied, and the fact that its problems often require for their solution quite advanced mathematical results should not be allowed to obscure the fact that statistics is essentially an independent discipline dealing with the uncertain and the unpredictable while mathematics is a branch of pure logic in which there are no blurred edges. Outside the realms of pure mathematics, deductive logic and similar subjects, error inevitably arises and the error function is susceptible of statistical investigation. In sampling we try to arrange for the sampling system itself to introduce a random element so that the error can be brought under statistical control. We can then make useful statements about the behaviour of aggregates of such errors and about the probable behaviour or expected behaviour of individuals.

Prof. Kendall is himself a distinguished mathematician, and it is refreshing to find him taking to task those mathematical statisticians who ‘are constrained to parade their learning in order to maintain a place in the struggle for scientific recognition’. He says that he sometimes feels ‘that work which achieves a slight gain in generality at the expense of being incomprehensible is defeating its own purpose’.

The whole lecture is full of the pungent humour and sound commonsense for which Prof. Kendall is famous and could with advantage be read by anyone who is beginning the study of statistics; it should convince him that this branch of scientific method can justly be described as ‘the matrix of quantitative knowledge of nearly every kind, as the principal instrument yet devised by man for bringing within his grasp the terrifying complexity of things and relations-between-things and as a powerful illuminant of the process of rational thought itself’.

H. T.

Chance and Choice by Cardpack and Chessboard. By PROFESSOR LANCELOT HOGBEN.

[Vol. 1. Pp. 417. Max Parrish & Co. Limited, 1950. 50s.]

THE proper training of the student who will require to make use of statistical methods in his future occupation is a topic that has recently received careful consideration by the Institute in connexion with the revision of the examination syllabus, and the appearance of a new text-book will be of interest to those concerned with this problem. Prof. Hogben, Professor of Medical Statistics in Birmingham University, has clearly been dissatisfied with the position regarding training and has accordingly set to work to develop what he considers to be a suitable approach. The present work represents the first of two volumes on statistics.

It has become apparent that the rigorous formulation of some modern text-books goes well beyond the equipment needed for many practical problems. On the other hand without an appropriate mathematical background the proper appreciation of statistical problems becomes difficult and the question of training is largely reduced to establishing a proper balance between practical application and theoretical formulation.

Broadly speaking, Prof. Hogben has developed an approach which may be described as parallel to that of the Institute and his first volume covers similar ground to that of Vol. 1 of Johnson and Tetley's *Statistics*, i.e. large-sample technique. The second volumes will apparently each cover roughly the same ground. The important difference is that the Institute text-book relies on considerably more mathematics, though similar standards are assumed of the student.

Since he starts with a 'higher school certificate' standard of mathematics, Prof. Hogben has first to develop the mathematical equipment necessary for the study of the theory of arrangements, and accordingly his first chapter is devoted to the elements of the calculus of finite differences with particular emphasis on the characteristics of factorials. Thus equipped, the student is taken through the theory of arrangements, and this enables the author to broach the question of the meaning of equally-likely events and to direct the student's attention to the importance of selecting the correct model when formulating problems.

Chapter 3 opens with a discussion on expectation and leads up to the binomial distribution and problems based thereon. The normal curve is then introduced as a means of solving the computational difficulties arising from the solution of questions based on the binomial distribution. The definition of variance follows naturally, and a section on Tchebychev inequalities is included.

The problem of the distribution of the mean of small samples from binomial populations is discussed in Chapter 4 and questions of significance are considered in Chapter 5 after a very pertinent discussion of Bayes's theorem. The following quotation from p. 202 is typical of the author's approach throughout the book.

The two classes of frequency... call attention to a dichotomy in contemporary statistical thought. One school prefers to identify the concept of probability exclusively with the frequency of external events. Another identifies it exclusively with the frequency of correct judgments about them. Between the two extremes a more eclectic view is admissible, viz., (a) frequencies ascribed to events by particular hypotheses do not provide a sufficient basis for assessing the frequency of applying the latter correctly; (b) valid judgments about the frequency of applying hypotheses correctly have to rely on information derived from observations about the frequency of events which involve their use.

Chapter 6 is largely mathematical, on questions relating to moments and generating functions. In Chapter 7 the emphasis shifts from attributes to what the author describes as representative scoring, i.e. the introduction of numerical specifications and thus to the distribution of the mean.

Correlation is introduced in Chapter 8, as a generalization from rank correlation, and concomitant variation in Chapter 9. This latter chapter includes sections on analysis of variance and partial correlation.

Finally, Chapter 10 forms a brief introduction to sampling systems.

The book is plentifully supplied with examples but unfortunately answers are provided for only one set, dealing with questions involving heredity. There is neither index nor bibliography, and references to other works are inadequate. Possibly these items will be found in Vol. II but their omission detracts from the book. The printing and presentation are excellent, and only a few errors have been noted, for example the diagram on p. 395. Occasionally there is some untidiness in the arithmetic, as, for example, in the calculations at the foot of p. 367 where the details are shown in decimals but the calculations are made on the true fractional values. The introduction of some new terms and notations makes it difficult to do other than work through the book to obtain a full understanding, but this effort is well worth the making, and the book should be read by all those who are interested in the teaching of statistics and the training of statisticians.

R. E. B.

An Introduction to the Theory of Statistics. By G. UDNY YULE, M.A., F.R.S., and M. G. KENDALL, Sc.D.

[Pp. xxiv + 701. 14th ed. (revised and enlarged). Charles Griffin and Co. Ltd., London, 1950. 34s.]

WHEN Mr Udny Yule wrote the first edition of this book, which was published in 1911, he laid sound foundations for the teaching of statistics in the English-speaking world. In two major revisions—the first resulting in the 1937 eleventh edition, and the second producing the present fourteenth edition—Prof. Kendall has assisted in the skilful adjustment of the work to conformity with modern ideas without obscuring its original characteristic features. After nearly forty years ‘Yule and Kendall’ remains an outstanding standard text-book on elementary statistics. No better tribute could be paid to the insight of the original author or the judgment shown in effecting the successive revisions.

In this latest edition the *Theory of Attributes* has been condensed to three chapters. The originally rather formidable presentation has been simplified and it is to be hoped that readers will now give more attention to this useful and interesting subject. At the end of the book three chapters have been added on index numbers and time-series. These are useful additions and will often save the student the trouble or expense of referring to another book.

The chapters on small-sample theory and the analysis of variance have been expanded and thoroughly revised. The chapter on practical sampling problems should prove especially valuable. The treatment of analysis of variance is, perhaps, a little over-ambitious: there is some evidence of haste or oversight, and parts of Chapter 22 should be read very critically if a satisfactorily clear idea of the subject is to be obtained.

The more authoritative a text-book and the more widespread its influence, the more is loose phraseology to be deplored. It is, therefore, to be hoped that the

phrase 'the sampling distribution of a parameter' (p. 459) will disappear from future editions, especially in view of the footnote about 'statistic' and 'parameter' on p. 414.

The extensive bibliography, a feature of earlier editions, now disappears, and the student is referred to the bibliography in Kendall's *Advanced Statistics*. The latter is, however, quite unsuitable for students of *elementary* statistics and it is greatly to be regretted that only vestigial signs of a bibliography, in the form of occasional footnotes, remain in the present edition of Yule and Kendall.

Despite these few shortcomings it is abundantly clear that this most recent revision should ensure a continuance of this old favourite in its accustomed place at the centre of English statistical literature.

N. L. J.

Some Theory of Sampling. By WILLIAM EDWARDS DEMING.

[Pp. xvii + 602. New York: John Wiley and Sons; London: Chapman and Hall. 1950. 72s.]

THE author of this book is Adviser in Sampling in the Bureau of the Budget, Washington, and has had many years' experience of surveys and censuses of various aspects of human organizations. He has now condensed his knowledge of the problems arising in the planning and conduct of such investigations in a form which is intended to help both mathematical statisticians lacking experience of applications, and 'the mature specialist in subject-matter who, like the author, must teach himself in the theory of statistics'. This review will discuss the book from a viewpoint nearer to that of the first than of the second of these two classes.

From the point of view of the mathematically trained statistician the book represents a rather expensive medium for four very interesting chapters on statistical methods applied to surveys in general, two chapters on special applications ('Inventories by Sampling' and 'A Population Sample for Greece') which are in effect reprints of articles already published in statistical journals, and a short chapter on 'Distinction between Enumerative and Analytic Studies'. This chapter is, in effect, an exhortation to the reader to remember when to use 'with-replacement' sampling theory, and when to use 'without-replacement' theory.

The person who decides to learn his theory of mathematical statistics from the book gets much more for his money. There are no fewer than ten chapters on statistical theory. Whether they constitute a good medium for studying the subject is rather doubtful. The author himself suggests that 'straight' statistical text-books should also be studied. While there is something to be said for theory developed concurrently with applications in which the reader is interested, it must be pointed out that Part V of the book, entitled 'Some Further Theory for Design and Analysis', contains five chapters and is subsequent to all discussion of practical problems. The quotation at the head of the seventeenth (and last) chapter—'But this whole business is too large to deal with at the tail-end of a letter'—is, unlike some of its fellows, most piquantly pertinent.

We will now reverse usual review practice and, having described what appear to be somewhat important shortcomings in the over-all design of the book, proceed to refer to some of its many virtues. Of these the most immediately appealing is the thoroughness with which specific types of practical problems are discussed. Where it is appropriate, alternative solutions are given, the author

being at pains to give credit where he considers it is due. This 'talking-around' the subject is immensely helpful in making the reader feel at home with the problem, since it gives him time to orientate his own ideas and, maybe, to see how they tally with the solutions given. In particular we may mention the discussion of methods of dealing with 'duplicates' (p. 94) which, though comparatively brief, is a neat example of the author's method of exposition.

Another useful feature is the presentation of key formulae in compact tables, obviating the necessity for searching for particular results among pages of text. We may note particularly the tables of Variances Valid for any Universe (p. 102) and for Two-celled Universes (pp. 111 and 115); of Notation for Two-stage Sampling (p. 142) and for Cluster-sampling (p. 192). This method of presentation could be used with advantage in certain portions of the book where at present it is not used.

The author is the fortunate possessor of an attractive style of writing which makes the book a pleasure to read even when the reader disagrees with the opinions expressed. Let it be said at once that such disagreement is rarely on technical matters. Dr Deming's treatment of the theory and methods of application is, in itself, clear and unexceptionable. It is only the occasional odd opinion which arouses doubt. However, much can be forgiven a man who introduces the delightful technical term 'chunk' for 'a convenient slice of a population'.

N. L. J.

Report of the Interdepartmental Committee on Social and Economic Research.

[Pp. 13. London: H.M. Stationery Office, Cmd. 8091, Dec. 1950. 6d.]

Guides to Official Sources, No. 1, *Labour Statistics*. Interdepartmental Committee on Social and Economic Research.

[Rev. ed. Pp. v+38. London: H.M. Stationery Office, 1950. 1s. 3d.]

IN 1947, the Government appointed an Interdepartmental Committee on Social and Economic Research

'To survey and advise upon research work in Government Departments and, in particular, (a) to bring to the notice of Departments the potential value for research purposes of the material which they collect, and to suggest new methods and areas of collection; (b) to advise on how there could be made available to research workers information gathered for their own purposes by the Departments which has potential value as material for research'.

Members of the Committee include academic as well as official representatives, and two of the present members are actuaries—J. G. Kyd of the Faculty, and L. G. Starke of the Institute.

In 1948, the Committee reported upon the manner in which Departments could more effectively help the outside research worker; considered the preservation of research material and the confidentiality of information collected by Departments; and included an account of a detailed survey of the Ministry of Labour and National Service (from which has emerged the Guide reviewed here).

A further report has now been issued which carries the account of the work of

the Committee to July 1950. With so much varied research being undertaken by Government Departments, Research Institutes and Universities, the Committee stress the importance of adequate collaboration between these agencies in the interest of economy of effort, and so that the products of each should be enlarged by the knowledge gained by the others. As an example of the work of the Committee in this direction, they quote co-operation between the London School of Economics, the Population Investigation Committee, the Ministry of Labour and National Service, and the Central Office of Information in a study of occupational and social mobility.

Continuing their surveys of material in Departments, the Committee have been engaged in evaluating the material of two major Departments—the Ministry of Education and the Board of Trade. The extensive ground covered in these surveys is briefly described in the report. The Committee make the welcome announcement that the General Register Office is collaborating in the preparation of Guides to census and vital statistics.

Special action has been taken to extend the responsibility of the Public Record Office to the conservation of research documents in the possession of Government Departments. Steps have been taken also to make available to outside research workers some of the papers originally prepared by Departments for domestic use only.

The report is an imposing record of achievement, of invaluable public service, patient and unrewarded, and a promise of benefits to come.

By no means the least important of the services rendered by the Inter-departmental Committee is the Guide to Labour Statistics. Students of economics and social science have often experienced the frustration of being unable to find, in the plethora of official statistics, just that small but vitally important piece of information which they require. They are sure it must exist somewhere, but infuriatingly it eludes them. It is the old story of a needle in a haystack. Here at least is one guide to a haystack viz., the Ministry of Labour and National Service. The Ministry of Labour was chosen for the first survey because its work is of both social and economic interest, and because it has a long tradition of co-operation with research workers. The present booklet, first issued in 1948 as an experiment, has proved such a success that a revised edition has been issued to take account of the changes in the statistics of manpower, and of the insured population brought about by the introduction of the National Insurance and the National Insurance (Industrial Injuries) Acts.

As a description of the information collected by the Ministry of Labour, this booklet is not only complete, but is a thoroughly workmanlike document to which reference is facilitated by logical arrangement and clear chapter headings. A short preface giving the historical development of the statistical service of the Ministry (from a Parliamentary Resolution of 1886) will enhance the perspective of the student. The available information is considered under four headings:

- A. Employment and unemployment: General;
- B. Employment and unemployment: Special Groups;
- C. Wages, earnings, hours and industrial relations;
- D. Retail prices and family budgets.

The student of statistical organization will gain much from an account of the manner in which estimates of insured employed persons have been derived, and the mode of preparing other manpower statistics; also from an account in another part of the booklet of the extent to which continuity of series can or should be

maintained. Reference is made to the Standard Industrial Classification and, though the discussion might have been a little fuller, it is appreciated that a guide cannot be as discursive as a text-book. It is good to see that there is greater emphasis on function, an aspect which, with the growing specialization in industrial processes, will have to be considered to a greater degree in future occupational (as distinct from industrial) analyses—for a man may change his industry without changing the particular step in production which he performs.

The guide contains, as all guides should, a list of the reservations to be borne in mind in applying the figures to special problems.

The Ministry of Labour has concerned itself not only with man-power, but with remuneration, and the manner in which that remuneration is spent—the so-called 'cost of living'—and a wealth of economic material has been accumulated, all of which is adequately described.

At a time when perhaps students find that too much (for their liking), rather than too little, is published, the description of published sources of information, with a detailed subject index in the appendix, will be found most useful; so will a list of the principal measures yielding statistical material which are administered by the Ministry, and the list ends with a welcome reminder that despite quips about bureaucracy the Ministry still relies for a large part of its information on the voluntary co-operation of industry and the public.

The guide has stood the test of time and there is therefore little to criticize in it. What we do criticize is the slow appearance of similar guides to other official fields—they are overdue.

B. B.

Tables d'intérêts et d'annuités éditées par le Crédit Communal de Belgique.

[Pp. 163. Crédit Communal de Belgique, Brussels, 1950. Privately printed.]

THESE tables, which were constructed during the war, are now published in commemoration of the ninetieth anniversary of the foundation of the Crédit Communal de Belgique and a copy has been presented to the Institute Library. Values of $(1+i)^n$, v^n , $s_{\overline{n}|i}$, $a_{\overline{n}|i}$ and $1/a_{\overline{n}|i}$ are given to 8 decimal places at rates of interest progressing by $\frac{1}{8}\%$ from 2% to 8% and for all values of n from 1 to 60 both inclusive. Tables of $(1+i)^{1/m}$, $i^{(m)}$, $i/i^{(m)}$ and $i^{(m)}/i$ to 8 decimal places and at the same rates of interest are included for $m=2, 4$ and 12 .

The tables should be very helpful to all those who need to make calculations either at the rates of interest included in the book or at awkward rates in respect of which no tables are available. For interpolation when functions are required at an unusual rate of interest, or for inverse entry when the rate of interest is unknown, tabulation at rates progressing by $\frac{1}{8}\%$ or $\frac{1}{16}\%$ is not the most convenient.

In the preamble to the table of $i^{(m)}$ it is stated that there is little use for this table but that it has been included because it was used in the calculation of $i/i^{(m)}$ and $i^{(m)}/i$. The editors appear to have overlooked the fact that the inclusion of this table goes a little way towards removing a shortcoming of the book, namely, that the five main tables are of very limited use to those who are normally concerned with nominal rather than effective rates of interest.

P. F. H.