

REVIEWS

The Factorial Analysis of Human Ability. By GODFREY H. THOMSON.

[Pp. 326+xv. University of London Press, Ltd. Price 16s.]

It is generally accepted that man's intellectual gifts vary quantitatively and qualitatively; that some are capable musicians, that others possess a flair for mathematics, and that others again have a high degree of general intelligence. But whilst no one doubts the existence of special abilities there has been diversity of opinion regarding the assessment of the factor of "common sense". Descartes wrote that this quality must be, of all things, the most equally distributed for nobody desires a larger measure of it than he already possesses.

When, in 1904, Spearman developed a theory of a general factor which played its part in every intellectual task together with a factor which was specific for each individual task—the Two Factor theory—controversy centred rather about the mathematical basis of the theory than upon the inherent plausibility of the mechanistic explanation of the functioning of the human mind. Recent observations have shown that some specifics appear in a number of intelligence tests of a similar character, and to allow for this either similar tests had to be excluded from test batteries (but who was to define "similar" before the tests were given?) or an extension of the theory was required to include group factors in addition to the general factor and specifics. Spearman seems to have favoured the former course whilst Holzinger produced a Bifactor Theory incorporating group factors. Then a few years ago Thurstone generalized the mathematics of Spearman's theory and introduced the notion of common factors in addition to the specifics; according to this theory there is no general factor applicable in all intellectual tasks.

Other psychologists have proposed even further variations on this factorial theme but Thomson is inclined to think that his (1920) Sampling Theory, which hypothecates "a number of factors at play in the carrying out of any activity such as a mental test, these factors being a sample of all those which the individual has at his command", is more likely to fit in with advancing physiological theories.

The unfortunate aspect of this theorizing is that no crucial experimental test has been evolved which will eliminate once and for all one or more of the hypotheses proposed. One set of data derived from actual intelligence tests may, according to the viewpoint of the experimenter, be a successful illustration of any one of several theories. If a memory test, for example, turns out to have a large share in a general factor then the theory of a general factor is not disproved but the test is regarded as involving something else besides pure memory which is hypothecated

the size of the battery by the elimination of tests which had little bearing on subsequent actuarial success.

The revised battery could then be applied to any potential actuarial student and the result made the basis of vocational advice. The practical difficulties involved in preparing a suitable actuarial battery of tests and in grading the qualified actuaries might prove insuperable but the principle of the method is clear.

H. L. S.

Methods of Statistical Analysis. By C. H. GOULDEN.

[Pp. 277 + vi. John Wiley and Sons, Inc. (London: Chapman and Hall.)
Price, 17s. 6d.]

THIS is almost certainly the best introduction to modern statistical methods which the reviewer has seen. The worked examples and the exercises, invariably based on problems encountered in actual, usually agricultural, practice, are a distinctive feature of an excellent book.

H. L. S.

Monetary Equilibrium. By GUNNAR MYRDAL.

[London: William Hodge, 1939. Price 12s. 6d.]

THERE is no doubt that when Mr Keynes's *General Theory* was published, the first impressions of reviewers and commentators were that something revolutionary—a break with orthodox tradition—had been written. Since then, however, it has become apparent that these thoughts were premature; economic science has been developing along similar lines on the Continent, particularly in Scandinavia, for the last 30–40 years. In fact it has been stated that if Mr Keynes and Mr Hawtrey had been better acquainted in their student days with the works of the great Scandinavian and Austrian Economists, and in particular with the theory of money as developed by Knut Wicksell, they would have reached their present positions earlier and more easily. [See review by Carl Iversen of Dr Brinley Thomas's *Monetary Policy and Crises. A Study of Swedish Experience*", *Economica*, May 1939.]

Monetary Equilibrium, by Prof. Myrdal, Professor of Economics at Stockholm University, gives added weight to the above point of view. The book is a partly revised version of an essay which was published originally in Swedish in 1931. The book is what Myrdal terms an immanent criticism of the monetary theory of Knut Wicksell. Wicksell's most important works *Lectures on Political Economy* and *Interest and Prices* have now been translated into English, and English Students of monetary theory can study his ideas in detail. Prof. Myrdal, however, sets out briefly but clearly the heart of Wicksell's theory, and states

Wicksell's three conditions for monetary equilibrium, namely, that the market rate of interest must

- (1) equal the marginal technical productivity of real capital or what Wicksell defined as the "natural" rate of interest,
- (2) equate the supply of and the demand for savings,
- (3) guarantee a stable price level, primarily of consumption goods.

Prof. Myrdal devotes a chapter to each of these conditions, his aim being to obtain a precise meaning for these concepts, and then to modify them in any way which he considers necessary. He demonstrates that condition (3) is not consistent with conditions (1) and (2), and concludes that conditions (1) and (2) constitute Wicksell's most important contribution to monetary theory.

An important innovation introduced by Prof. Myrdal is a distinction between calculations *ex ante*, and calculations *ex post*.

In respect of any time period a business man makes estimates of his expected gross income and expected costs as at the beginning of the period; these represent calculations *ex ante*, and according to Prof. Myrdal they can be compared with the *ex post* calculations or the realized income and costs according to the business man's books as at the end of the period. "In the *ex ante* calculus it is a question...of the anticipations, calculations, and plans driving the dynamic process forward" and "the real problem to be solved in monetary theory is: How does a tendency to disparity in the saving-investment equation develop into an *ex-post* balance?" *Ex post*, saving always equals investment (this definition agrees in this respect with that of Mr Keynes), but *ex ante*, they may not be equal. Accordingly Wicksell's conditions (1) and (2) must be considered in *ex ante* terms.

The theoretical argument assumes that comparisons between *ex ante* and *ex post* calculations can be made fairly precisely, but it must be remembered that in the real world the accounting period is usually one year, and that decisions about business policy are made continuously; thus at a particular point in time decisions will have been made leading to results which can only be appraised in the distant future; in other words is it possible to relate any given *ex post* calculations to some definite *ex ante* calculations? Further, the concept of *ex ante* or anticipated saving and its relation to anticipated investment is difficult to understand precisely. It seems more natural to assume that business men will make investment decisions having regard to their past savings, and current conditions in the loan market.

There can be no doubt that it is correct to introduce expectations into economic analysis, but in so far as it makes the analysis more realistic, it also introduces much vagueness into the final results, and prevents the economist from looking very far ahead. There is also a grave danger that the economist will assume a simple psychology for the behaviour

as being almost independent of the general factor. A peculiar combination of *a priori* reasoning and experimental deduction have culminated in a set of theories which are elastic enough to fit almost any facts with which they are confronted.

As regards the question of technique the statistician has several criticisms to offer. The factorial hypothesis is another example of the linear hypothesis which is a familiar feature of agricultural experiments; yet the modern statistical methods developed to deal with such hypotheses are nowhere evident. Then, again, the scores observed in the application of a battery of n intelligence tests to N subjects are seldom explicitly adopted and only the correlation coefficients between the tests are used. Although the $n \times N$ original scores are reasonably epitomized

by the $\binom{n}{2}$ different correlation coefficients between the tests yet a deal of information is thus ignored. Furthermore, it still seems to be the custom among psychologists to calculate the standard error of a correlation coefficient by inserting the observed value of r into the formula $(1-r^2)/\sqrt{N}$ and at least implying that the usual "normal" rule is applicable.

Professor Thomson in the present volume sets out to explain in a simple and practical manner involving the minimum of mathematics, Spearman's and Thurstone's methods of factorial analysis. The style is admirable and the explanations lucid and the author is at pains to mention the limitations of the methods he is expounding. Is it due to the fact that Thomson has an antithetical theory of his own that he writes "That the factor theory has been a guide and a spur to many investigators cannot be denied, and it is probably here that it finds its chief justification"? Whilst the book should be a landmark to the serious student of factorial analysis, for the actuary vaguely interested in psychological topics it would prove a depressant rather than a stimulant.

Perhaps the most interesting and instructive part of Thomson's book is where he explains how vocational selection may be exercised without the introduction of factors. Suppose, for example, a control batch of actuarial students were tested by a large battery of mental tests. Several years later the survivors of this group could be graded in some manner according to their "success" in the actuarial world. Then, on the usual assumption of linearity of regression (which would be tested statistically), the probable degree of actuarial success, \bar{x}_0 , say, could be estimated by an equation of the form

$$\bar{x}_0 = a + b_1 x_1 + b_2 x_2 + \dots + b_n x_n$$

where x_1, x_2, \dots, x_n are the marks obtained in the original battery of n tests. The coefficients a, b_1, b_2, \dots, b_n can be calculated by a very practicable method due to Aitken and described in detail by Thomson. It might be possible from a consideration of the above equation to reduce

of the business world which fits in with his own theories and his own ideas on how individuals ought to behave. Prof. Myrdal clearly warns his readers about these dangers in his concluding chapter.

Many English economists, particularly the followers of Mr Keynes, will quarrel with Prof. Myrdal over his treatment of the determination of the rate of interest. Prof. Myrdal is not at all clear on this point. Whilst he says that in monetary equilibrium the rate of interest, or rather the complex of interest rates and credit conditions, must satisfy conditions (1) and (2), he admits that these conditions can be satisfied for any level of economic activity, and further that there is an indifference field where shifts can take place within the complex of interest rates without disturbing monetary equilibrium. It is also implicit in his argument that over a short period the total amount of saving depends on the level of incomes, and if this be admitted we arrive at Mr Keynes's query: if savings depend on the level of incomes, and total capital investment depends on the complex of interest rates, then what determines the rates of interest? As is well known, Mr Keynes's answer is the quantity of money as determined by the banking system. Prof. Myrdal's book should lead to some interesting controversy on this question; here we only point out that it cannot be correct to follow some economists who consider the banks as an "individual" holding certain types of assets, and then assert that the complex of interest rates is determined by individuals' preferences for assets and yields in general. This argument ignores the vital fact that the banking system is the only "individual" who can vary the supply of cash at will; in order that individuals in general may become more liquid, the banks must become less liquid, and if they are not prepared for this then they must revise their terms of lending.

Prof. Myrdal's argument is highly abstract throughout, and presupposes some knowledge of economic theory on the part of the reader. The publishers are to be thanked for making available to English students of economic science an important contribution to monetary theory.

H. W. H.

Tables of Random Sampling Numbers. By M. G. KENDALL and B. BABINGTON SMITH.

[Pp. 60+x. No. XXIV of *Tracts for Computers*, edited by E. S. Pearson, D.Sc., Cambridge University Press. 1939. Price 3s. 9d.]

L. H. C. TIPPETT's tables of 40,000 random digits, published in 1927 as No. XV of *Tracts for Computers*, have sometimes proved inadequate for lengthy sampling investigations. Hence the need for these new tables which contain 100,000 digits produced by mechanical means.

The digits are conveniently printed in sets of 4, and in blocks of 1000, there being two such blocks to a page.

It is pointed out in the Introduction that a table of random digits should be able to pass tests for randomness, but that it must be expected to contain patches which do not by themselves pass these tests. Certain blocks of 1000 which do not pass the tests are indicated; these blocks should not be used by themselves, though they may safely be employed in the larger blocks of 5000 of which they form part.

C. D. R.

Life Insurance. By JOSEPH B. MACLEAN.

[Pp. xii + 668. McGraw-Hill Publishing Co. Ltd., London, 1939. Price 24s.]

AN earlier edition of this book was reviewed in *J.I.A.* Vol. LV, p. 206. In this, the fifth edition, the text has been thoroughly revised, some parts having been completely rewritten, and a new chapter added. It can be recommended to those requiring a non-technical text-book on the subject of life assurance with special reference to American practice.

C. D. R.