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THE DESIGN, APPLICATION AND FUTURE DEVELOPMENT OF THE F.T.-ACTUARIES INDEX

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1. The original Actuaries Index was designed in 1929 and was maintained with broadly the same format and principles for more than thirty years, changes to constituents and groups being made in 1950 and 1957. " Investment Policy and Index Numbers " submitted by the authors in 1956 discussed the original index in some detail. This index was, of course, designed for manual calculation and it is remarkable that only eight years ago electronic computation was not even contemplated. In fact the word computer was never mentioned in the paper or in the discussion. With electronic facilities now so well developed, the whole approach to indices is changed. The limitations, formerly imposed by manual calculation, on the size, the scope of the averaging procedures and the weighting methods, and the frequency of computation are no longer important.

2. In these circumstances the index procedure required complete recasting. The first question was the frequency of computation. There is little doubt that, for many of the purposes of an index, daily, rather than monthly, computation is needed. This facility, however, represented a major problem as the task of collecting prices for a large index on a daily basis was clearly beyond the resources of the Actuarial Tuition Service staff who had computed the index for many years. Furthermore, the former procedure with distribution of the results by post would have delayed publication. In these circumstances collaboration with a newspaper organisation offered many advantages, solving both the staff problem and the publication difficulties simultaneously. It was fortunate that at the same time as the Investment Research Committee was considering this problem the statistical staff of the *Financial Times* were also contemplating an

extension of their daily index facilities. The logical development was for the actuarial organisations and the leading financial newspaper to enter into a joint index project, the design and averaging methods, etc., being the responsibility of the actuaries with the newspaper staff doing all the pricing, collecting the statistics and using the computer facilities of the National Cash Register Company. The selection of constituents and groups was a joint undertaking of the actuaries and the *Financial Times* statistical staff.

3. Once this project had been agreed the way was open to design an index which would continue to satisfy the principal uses already established for both its " parents ". These uses are :

(a) *Investment Policy*

The original purpose of the Actuaries Index, as envisaged by C. M. Douglas, was to serve as a guide to investment policy, to assist in the timing of equity purchases and in the selection of industrial groups, etc.

(b) *Portfolio Performance*

The F.T. 30 share index, being available every day, had become the accepted standard for checking the progress of equity portfolios.

(c) *Historical Studies*

Again the F.T. 30 share index with its long unbroken series has been the recognised standard for studying the relative yield of equities as against gilt-edged and for watching the long-term progress of equities generally.

(d) *Economic Surveys*

If the national economy becomes subject to a greater degree of planning, the need will arise for reliable information regarding the progress of profits and dividends compared with wages, productivity and living costs. A comprehensive index correctly reproducing the results of a substantial proportion of U.K. industry will be an important factor in national economic planning.

(e) *Other Day-to-day Investment Problems*

Both the original indices had been used for a variety of investment problems. Examples of these are :

(i) Pricing unquoted securities.

(ii) Making approximate valuations.

(iii) Comparing the prices of deals in the same share at different times.

4. Bearing in mind these varied requirements, the Joint Investment Research Committee of the Faculty and Institute was charged with the task of designing suitable indices for equities, preference shares, debentures and gilt-edged stocks. Details of the procedures involved in selecting the constituents, in calculating the averages and in maintaining the series up-to-date are discussed in Parts I and II below.

5. Part III, entitled " The Index in Practice ", deals with the improved facilities the new indices offer towards the solution of some of the varied problems of investment management and economic research.

6. Some suggestions are made in Part IV for further development of the index facilities. Finally, in Part V, entitled " Investment Analysis by Computer ", attention is drawn to the need for further research work to make more use of the valuable statistics already recorded in the computer.

7. It must be understood that in making their comments on the various indices the authors are expressing their personal views which may not necessarily reflect the opinions of the other members of the Investment Research Committee.

Part I

DESIGNING THE EQUITY INDEX

Choice of Constituents

8. As the index is intended to reflect the performance of the whole U.K. ordinary share market, a survey was first made of all the companies with shares quoted on the London Stock Exchange and equity market capitalisations over £1 million. There is little to be gained by including the mass of small companies with a lower capitalisation than this. In the case of many of them dealings in their shares are infrequent so that prices are largely " nominal " and quotations are wide.

9. Some 650 companies each with market capitalisation greater than £4 million had a combined capitalisation equal to some 90% of the total for all the possible companies with market valuation greater than £1 million. It was decided, therefore, to base the selection of securities for the index on this group of 650 companies. Companies whose trading activities were completely outside this country, companies controlled by other U.K. concerns or whose assets consisted largely

of shares in companies already included in the index, were omitted. Industrial holding companies, such as Thomas Tilling, B.E.T., etc., were excluded because it is impossible to allocate such companies to specific industrial groups.

INDUSTRIAL GROUPS

10. Consideration was first given to the groupings used in existing indices and in the classification of the *Financial Times* Profits Tables. The following broad groups were then chosen: Capital Goods, Consumer Durables, Consumer Non-Durables, Chemicals, Oil, Shipping, Financial and Miscellaneous.

11. The first three groups and the financial group were next subdivided into fairly homogeneous sub-groups, each considered to be affected by similar broad economic developments. Companies with diverse activities were placed in one of four miscellaneous groups, according to whether their output ranked as capital goods, consumer durables, consumer goods or unclassifiable. Some of the resulting groups were felt to be too small and these were increased by bringing in those companies with a market valuation in the £2 to £4 million range.

12. Originally the financial groups covered 128 securities of which 54 were those of investment trusts. It was considered that this latter figure was much too large, giving undue emphasis to this particular financial sub-group. Consequently for these the lower valuation limit was raised to £16 million which reduced the number to 20 and the total financial companies to 94. The net result of the exclusions and the addition of the few companies with a market capitalisation below £4 million was to leave 594 securities to form the All-Share Index. Their total equity capitalisation amounted to 60% approximately of the value of all quoted equities in the sections concerned. Ignoring the 94 financial companies left 500 industrial constituents, which form the basis of the alternative 500 share index.

DIVIDENDS AND EARNINGS

13. It had been decided that average dividend yields and average earning yields should be provided. Unfortunately in the case of the financial groups it is not possible to obtain from the published accounts reliable earnings figures because of the accounting privileges given to banks, discount houses and insurance companies. Even in those cases where some earnings figures are available they are hardly comparable with the earnings yields on industrial shares. Consequently the 500 share index with its sub-indices should be regarded as

the standard daily index recording earnings yields. However, for portfolios including important holdings of shares in financial companies the 594 share index will probably be the better standard for checking the price and dividend performance.

METHODS OF AVERAGING

14. In the previous paper it was stated that the method of construction should depend on the purpose of the index and since there are several purposes a compromise was always necessary. The disadvantages and advantages of the geometric and arithmetic means were outlined. Several speakers in the discussion recognised that the authors were not convinced themselves about the advantages of the geometric mean. If one was thinking in terms of a *price* index only, then much could be said for the geometric mean, but as most users of indices were not content with a simple price index and usually wanted a standard for comparative purposes, the arithmetic average would appear to be the more appropriate. During the discussion J. D. Binns remarked, " If we were starting afresh I would urge the method of weighted arithmetic mean ". Almost all well known indices used in Europe and in the United States of America are arithmetic and for many of them the weights are proportionate to market capitalisation. The Indices of Standard and Poor (U.S.A.), Commission de la Bourse (Belgium) and the Swiss Bank Corporation are calculated in the same way as the F.T.-Actuaries Index.

15. The new index is basically a weighted arithmetic mean of the price relatives. Formally it can be written

$$\frac{\Sigma w \dfrac{p_t}{p_o}}{\Sigma w}$$

and the main question for consideration is that of the choice of weights. Weighting is necessary because of the varying importance of the securities from an investment point of view. If the purpose of the index is to reflect movements of the market as a whole, then an appropriate weighting would be the market capitalisation of the securities in the index.

16. If a purely price index is considered then theoretically the weights should be fixed because changes in the index should reflect changes in prices only. However, the purpose of the index is to measure movements of the market as a whole so that it would be misleading to regard it as a price index only. It is, perhaps, better

to regard the constituents as a portfolio representing the market, and the index as a measure of the changing value of the portfolio. Fixed weights imply a fixed portfolio and the main objection to such a portfolio is that in the long run it would cease to represent the market as a whole. The only way to represent the changing market is to construct a set of rules designed to ensure that the constituents are in some reasonable sense kept up to date. However, in the first place it is helpful to consider the construction of a fixed weight index.

17. A common form of fixed weight formula is :

$$\frac{\Sigma n_o p_o \frac{p_t}{p_o}}{\Sigma n_o p_o} = \frac{\Sigma n_o p_t}{\Sigma n_o p_o}$$

where p_t is the price at time t, and n_o is the number of shares at the base date. It is well known that one cannot leave the position as simple as this. Some adjustment must be made for bonus issues, rights issues and share splits, otherwise the ratios p_t/p_o will become meaningless and invalidate the index. It is necessary therefore to decide what capital and other changes must be allowed for and construct a set of rules for dealing with them.

18. The rules can generally be interpreted as a redistribution of the "portfolio" by a notional purchase and sale, assuming no costs. This notional transaction may be confined to the particular constituent affected, or may be spread over the group concerned, or the whole index. To demonstrate these procedures in general terms, suppose that the first change is made at time s and let n'_s and p'_s be the number of shares and the prices just after the change. The p'_s for those securities affected by the change may be theoretical prices calculated from the terms of the change and for the remaining securities $p'_s = p_s$. The old portfolio is notionally sold for $\Sigma n_o p_s$ and the proceeds distributed over the new set of constituents in proportion to $n'_s p'_s$. If the value of new portfolio is denoted by $kn'_s p'_s$ then

$$\Sigma n_o\, p_s = \Sigma k n'_s p'_s \text{ and}$$

$$k = \frac{\Sigma n_o p_s}{\Sigma n'_s p'_s}\,.$$

The value of the new portfolio at time t, assuming no further changes, would be

$$\Sigma k n'_s p_t = \frac{\Sigma n_o p_s}{\Sigma n'_s p'_s} \times \Sigma n'_s p_t$$

and

$$I_t = \frac{\Sigma n_o p_s \cdot \Sigma n'_s p_t}{\Sigma n'_s p'_s \cdot \Sigma n_o p_o}$$

$$= \frac{\Sigma n'_s p_t}{\Sigma n_o p_o \times \frac{\Sigma n'_s p'_s}{\Sigma n_o p_s}}$$

$$= \frac{\Sigma n'_s p_t}{\Sigma n_o p_o \times \frac{\Sigma n_o p_s + V_s}{\Sigma n_o p_s}}$$

where V_s is the value of the shares involved in the capital change, i.e. $\Sigma n'_s p'_s - \Sigma n_o p_s$. In certain cases such as a take-over or repayment of capital V_s is negative.

Since there have been no capital changes between o and s and s and t, the formula can be written

$$I_t = \frac{\Sigma n_t p_t}{\Sigma n_o p_o \times \frac{\Sigma n_s p_s + V_s}{\Sigma n_s p_s}}$$

$$= \frac{\text{Current market valuation}}{\text{Adjusted base valuation}} .$$

19. The above formula is fairly general. It is the same in form as that for the F.T.-Actuaries Index. Thus, both the so-called fixed weight and current weight index numbers can be expressed symbolically in the same form. The results by each differ because the rules for capital changes differ. For example in the case of a rights issue the usual rule for a fixed weight index is that sufficient of the holding, in respect of which there is a rights issue, should be notionally sold to purchase the rights on the balance of the holding. In the above formula, if a denotes the security affected then $n_a p_a = n'_a p'_a$ and $V_s = 0$ so that $k = 1$ and the capital distribution is not altered. In the case of the current weight index, however, $n'_a p'_a > n_a p_a$ and V_s is positive and thus the capital distribution changes. If a security is deleted, then in both cases the capital distribution becomes that for the remainder of the securities. The point is that in the fixed weight index changes are kept to a minimum ; they are made only when there is no other procedure to follow. In the current weight index changes are made for these same reasons and also in order to keep it up to date, for example, when there are increases in capital and when it is considered that new or growing companies should be included in the constituents. It is only in this sense that the F.T.-Actuaries Index can be called

a currently weighted index. It might be thought that it would be reasonable to construct a current weighted index by the formula

$$\frac{\Sigma n_t p_t \frac{p_t}{p_o}}{\Sigma n_t p_t}.$$

20. However, there are important objections to such a formula. It is difficult to interpret as a meaningful portfolio ; it indicates the value at time t of a portfolio in which the cash amounts invested at the base date were proportionate to market values at time t. Further, if adjustments are not made there would be " breaks " in the series when the weights change. Also it would be difficult to introduce new securities. If modifications are made to avoid these difficulties, presumably one would arrive at the F.T.-Actuaries formula.

21. It is clear then that in practice the two extremes—fixed weights and current weights—are not practical possibilities and the F.T.-Actuaries formula is a good compromise reflecting current conditions. It is also obvious that all indices require some kind of chaining process. One can say, in effect, that at each change of weights a new index is constructed with the date of change as the base and it is then " linked " or " tied " to the old series.

22. It must be considered whether this formula is suitable when there are group indices. Many index services provide indices for industrial groups in addition to a combined index, and it is not obvious that the same continuity rule can be applied both to the group indices and the combined index. It will be remembered that the general rule is that when the weights are to be changed the portfolio is sold at the prices just before the change and the proceeds redistributed proportionately to the new capital values just after the change. For a group index this means that the sale and redistribution is made for the group only, because if this was not done continuity in the group index would not be maintained. On the other hand for the combined index the redistribution is made over all the constituents in the portfolio and it might be argued that this means lack of consistency in the indices as a whole.

23. Take the case of a capital increase in one of the constituents of group X. The general principle is that a proportionate amount of the shares in the index is " sold " and the proceeds used to " purchase " the shares of X in such manner that the individual capitalisations are proportionate to the new capitalisations required by the rules. If this is done for the group only, both in respect of the group index and the combined index, then the relative importance of group X in

the portfolio is not changed but over all the constituents the new capitalisations used in the index will not be proportionate to the actual new capitalisations. If, however, in the case of the combined index the sales are spread over the whole portfolio in accordance with the general rule, then the relative importance of group X is increased and there will be the inconsistency that the value of the group in the group index is not the same as its value in the combined index. It is easy to show that this amounts to saying that the combined index is no longer a weighted average of the group indices. This was true also for the Actuaries Investment Index (First Series) but was avoided in the second series by making the combined index a weighted average of the group indices, the weights remaining unchanged whatever the changes in individual constituents. This method would break down only if it was necessary to add or delete groups. Careful consideration was given to the question whether it was necessary for the combined index to be a proper average of the group indices. It is not necessary that the indices should be interpreted in this way, and, on balance, it was felt that the combined index should be adjusted in the same way as the group indices. Generally it seems reasonable to suppose that if the capital of a particular group is increased relative to that of other groups then its importance in the combined index should be increased and *vice versa* if the capital is decreased. For some problems of investment analysis, however, it would be more useful to have a proper average against which to compare the performance of individual shares. At any time t, I_t is not a criterion of the history of the constituents at time t; it is an indicator of the performance of a changing portfolio and its level has been influenced by securities which have been eliminated before time t. For comparison purposes, however, an analyst might wish to compare the performance of a constituent with that of the existing constituents only. An example of this is given in Part V.

Part II

DESIGNING THE FIXED INTEREST INDICES

24. The Actuaries Investment Index (Second Series) included seven price indices for fixed interest securities namely:

- $2\frac{1}{2}\%$ Consolidated Stock.
- Home Corporations.
- Debentures:
  - Investment Trusts.
  - Breweries.
  - Miscellaneous.
- Preference:
  - Investment Trusts.
  - Miscellaneous.

In addition there was an index for 15 to 25-year redeemable debenture stocks calculated by a somewhat novel formula. In the F.T.-Actuaries Index, the Home Corporations index and the irredeemable debenture indices have been discontinued and an index for redeemable British Government securities, calculated on principles similar to that of the redeemable debenture index, has been added.

Debentures

25. The redeemable debenture index is calculated so as to maintain the average outstanding term at about 20 years. There are fifteen constituents divided into three groups of five, according to redemption date. The three maturity periods are 1976-80, 1981-85 and 1986-90.

For each group at time t the average $\frac{1}{5}\Sigma\frac{p_t}{p_o}$ is obtained. Then if these averages are denoted by I_{1t}, I_{2t} and I_{3t}, the index at time t is obtained from the formula

$$I_t = \frac{100}{2}\left(\frac{1460-t}{1825}I_{1t} + I_{2t} + \frac{365+t}{1825}I_{3t}\right)$$

where t is the number of days from 31st December 1961. It will be seen that the weight given to the first group gradually diminishes whilst that to the third group increases. At the end of four years a new group will be introduced if this is possible.

Government Securities

26. The index for the redeemable Government securities adopts a similar moving-weight system, but in the first place the redemption yields are averaged. There are six securities divided into three groups, each of two securities according to the same three maturity periods as used for the debentures.

For each group the mean of the two redemption yields at time t is calculated, and if these are denoted by $Y_{1_t}\, Y_{2_t}\, Y_{3_t}$, then the average yield for all the securities is calculated by the formula

$$Y_t = \tfrac{1}{2}\left(\frac{1410-t}{1705}Y_{1_t} + Y_{2_t} + \frac{295+t}{1705}Y_{3t}\right)$$

where t is the number of days from 31st December 1961. The numbers 1410, 295 and 1705 were calculated from the condition that the average outstanding term for all values of t should be 20 years

precisely. For the price index the price is calculated for a 20-year stock with a 4% coupon to yield Y_t and the index I_t at time t is this price divided by the corresponding price at the base date, 10th April 1962, multiplying the result by 100.

PREFERENCE SHARES

27. The indices of preference shares have been constructed on the same lines as in the Actuaries Investment Index series, except that the price indices are now unweighted arithmetic averages of the price relatives instead of geometric averages. The method of selection was exactly the same as that set out in the Explanatory Memorandum for the Actuaries Investment Index (Second Series—revised), namely :

(1) Nominal amount in issue at least £1 million for investment trusts and at least £2 million for industrials.

(2) Stock must
   (*a*) be irredeemable,
   (*b*) carry no participating rights as to either capital or income,
   (*c*) not carry more than 25% of total voting strength,
   (*d*) be subject to a net rate of U.K. tax not less than 4s. in the case of investment trusts and 7s. in the case of industrials.

(3) Dividend must be
   (*a*) cumulative,
   (*b*) not tax-free,
   (*c*) well covered,
   (*d*) 6% or less.

Subject to these conditions, the index constituents are selected so as to provide a reasonable spread over the different industrial groupings.

There are two price indices, the one being based on 15 investment trusts and the other on 20 industrial companies. They are unweighted arithmetic averages of the price relatives, the prices being net of accrued interest.

For the yields, unweighted arithmetic averages are calculated from the yields of the individual stocks in the two groups.

The fixed interest indices are considered from a practical point of view in Part III.

Part III

THE INDEX IN PRACTICE

Investment Policy

(a) *The Phase of the Cycle*

28. The original theme of C. M. Douglas was that the business cycle is a vital factor in investment policy. Readers whose experience of finance is confined to the post-war period may feel that these cyclical movements are now of minor importance. Certainly the post-war scene has been dominated by inflationary forces and in general the trend of equities has been upwards, and of gilt-edged downwards. Now that the post-war shortages have been resolved and inflation is less prominent, more competitive conditions are likely to obtain and the business cycle may once again become important. The traditional investment theory was to buy equities at the bottom of the cycle when they were low and to buy gilt-edged at the top of the cycle when the high level of demand for capital had resulted in relatively high interest rates. This is an excellent theory provided the investor can correctly decide what phase of the cycle obtains at any particular time.

29. This question of using indices to study the progress of the business cycle, and thus to determine investment policy, was discussed at some length in the previous paper—see *T.F.A.* vol. 23, pp. 388-397 and *J.I.A.* vol. 82, pp. 339-347. An important technique is that described by A. G. Ellinger in his book *The Art of Investment*, and illustrated in Figures 1 and 2 of the earlier paper. These charts showed the progress of the four factors, dividend, confidence, fixed interest and activity from the 1st January 1946 to October 1955. It is interesting to note that when checking the final proofs in October 1955 the authors looked at the charts and agreed that the classical signals of a bear market were evident. Confidence had turned down, fixed interest appeared to be declining, dividends had flattened, and markings were little more than half their peak figure of 660 some months before. They were not then sufficiently confident of the technique to forecast the 30-40 point fall from 200 to 160-170 that was to take place by the time the paper was submitted five months later. To complete the historical record, these charts have been brought up to date, covering the period 1953 to 1963 inclusive (see Figures 1 and 2). Careful study of the charts around the period of the peak in 1957 and the trough of 1958 shows that in each case,

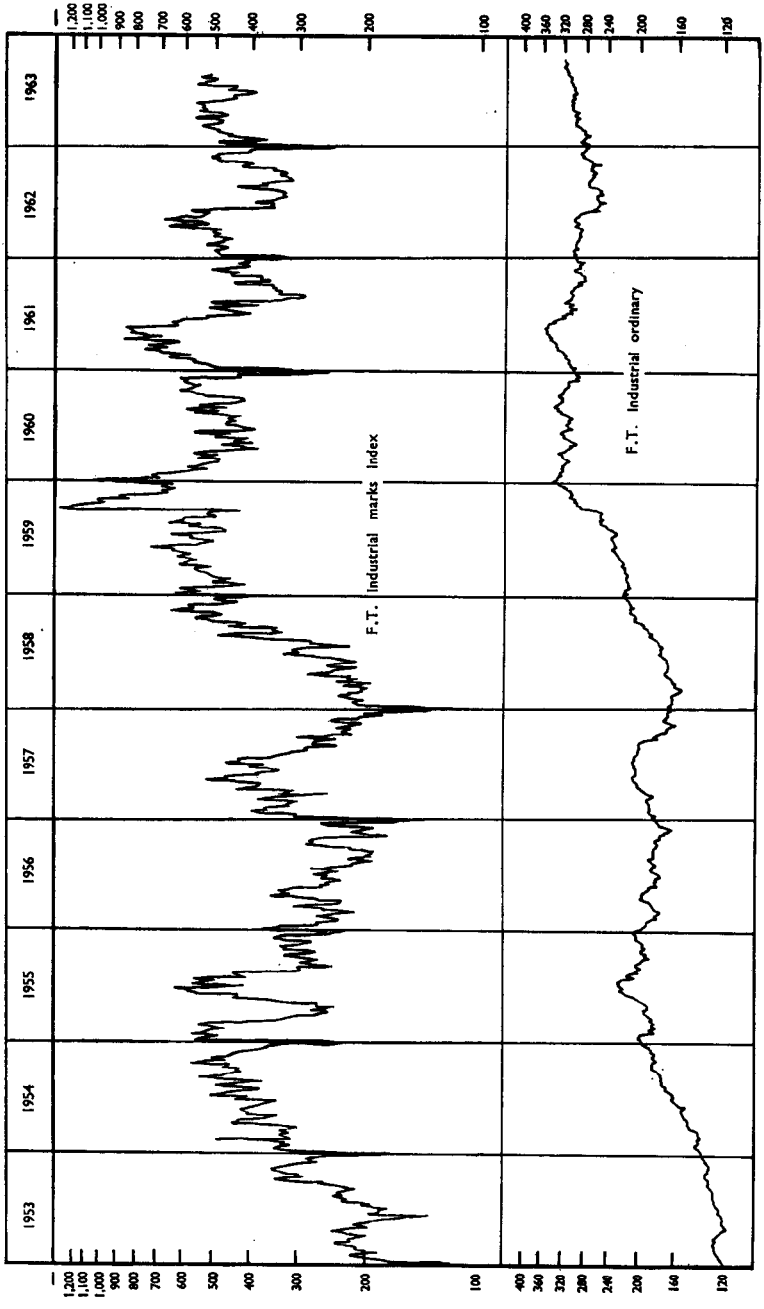
1963
1962
1961
1960
1959
1958
1957
1956
1955
1954
1953
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
F.T. Industrial marks Index
400
360
320
280
240
200
160
120
F.T. Industrial ordinary

Fig. 1

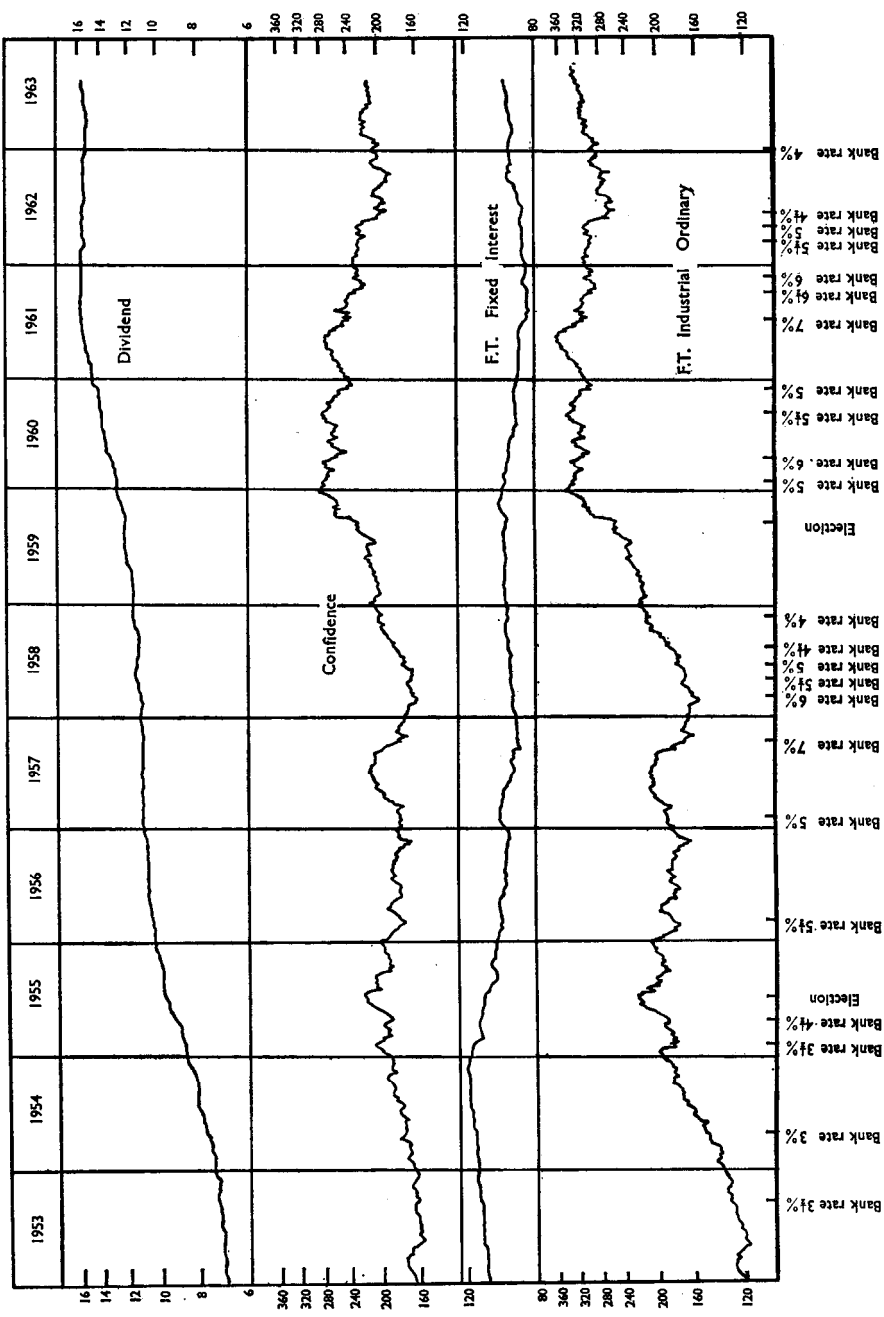
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
Dividend
Confidence
F.T. Fixed Interest
F.T. Industrial Ordinary
Bank rate 3½%
Bank rate 3%
Bank rate 3½%
Bank rate 4½%
Election
Bank rate 5½%
Bank rate 5%
Bank rate 7%
Bank rate 6%
Bank rate 5½%
Bank rate 5%
Bank rate 4½%
Bank rate 4%
Election
Bank rate 5%
Bank rate 6%
Bank rate 5½%
Bank rate 5%
Bank rate 7%
Bank rate 6½%
Bank rate 6%
Bank rate 5½%
Bank rate 5%
Bank rate 4½%
Bank rate 4%

Fig. 2

within a short period of the turning-point, and well before any major change had occurred in prices, dividends, fixed interest and activity were giving warning signals. In 1961, however, these indicators failed to give any advance warning of the sharp decline in the market.

30. This technique might well be improved if it were based on better statistics than the F.T. 30 share and Fixed Interest indices. The 500 share index with its much wider coverage should be a more reliable indicator of dividend trends than the 30 share index which can be unduly affected by a single dividend change. The F.T. Fixed Interest index can also be criticised, being a rather sluggish indicator of interest rate changes owing to the limited market in its preference and debenture constituents. The best index for this purpose is one based on gilt-edged stocks which are far more sensitive than debenture and preference issues. At first sight the Consols yield appears suitable, being the traditional pointer to long-term interest rates. Although automatically included in the indices because of its long history, Consols are really most unsatisfactory for this purpose as they are relatively inactive and are subject to considerable yield fluctuations relative to other undated issues. Treasury $2\frac{1}{2}\%$ is a much better guide to gilt-edged yields. Using this latter series the components of the 500 share index become :

$$\text{Index at 1st November 1963} = 115{\cdot}24$$

$$\text{Dividend Yield} = 4{\cdot}13\%$$

$$\text{Dividend} = 115{\cdot}24 \times \frac{4{\cdot}13}{100} = 4{\cdot}76$$

$$\text{Yield on Treasury } 2\tfrac{1}{2}\% = 5{\cdot}525\%$$

$$\text{Price index of Treasury } 2\tfrac{1}{2}\% = \frac{100}{5{\cdot}525} = 18{\cdot}10$$

$$\text{Confidence} = \frac{5{\cdot}525}{4{\cdot}13} = 1{\cdot}338$$

$$\text{Index} = \text{Dividend} \times \text{T } 2\tfrac{1}{2}\% \text{ index} \times \text{confidence}$$

$$115{\cdot}24 = 4{\cdot}76 \times 18{\cdot}10 \times 1{\cdot}338$$

Figure 3 demonstrates the progress of these three factors plotted each week from 10th April 1962 to date. The earnings index is also shown on this chart. The 500 share index history is, of course, too short to enable these charts to be much use to signal the upturn in the index which occurred in June 1962.

31. Another forecasting system, not mentioned in the earlier paper, is the " Dow Jones " scheme widely used in America. This

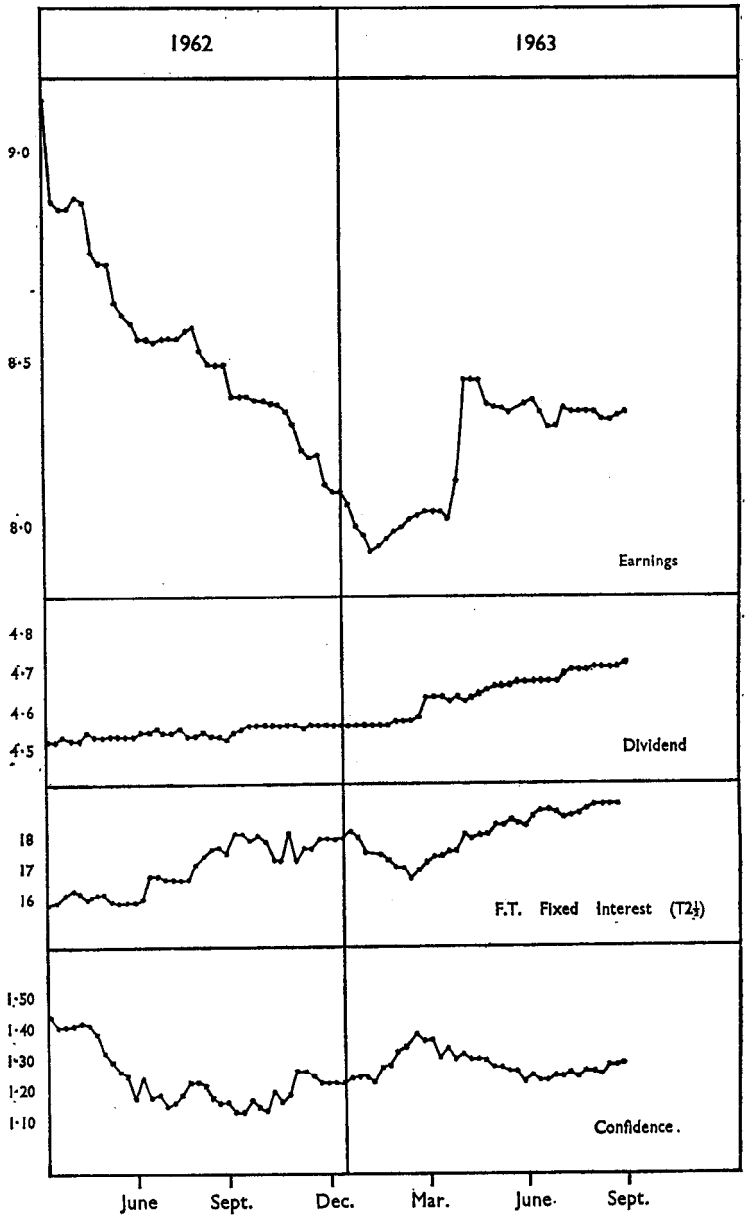
1962
1963
9·0
8·5
8·0
Earnings
4·8
4·7
4·6
4·5
Dividend
18
17
16
F.T. Fixed Interest (T2½)
1·50
1·40
1·30
1·20
1·10
Confidence.
June
Sept.
Dec.
Mar.
June
Sept.

Fig. 3

involves plotting side by side the " Dow Jones " 30 share index and an index of railway shares. A significant change of trend in the " Dow Jones " if confirmed by the rail index is often a precursor to a major move in the market. This technique has a certain logic behind it, as it is reckoned that any up-turn or down-turn in the economy is first revealed by rising or falling rail receipts and by a corresponding movement in the railway shares. In the U.K., with railways nationalised, this method is impracticable.

32. In the earlier paper the progress of the share index was compared month by month with figures for dividends paid and " earnings for Ordinary " from the *Financial Times* analysis of the reports received from 3000 companies. This study revealed that the turning-point of the dividends was invariably before those of the earnings and even before the corresponding moves in the share index itself. This is not surprising, because at the time of dividend declarations the directors' decision is based not so much on earnings for the previous year (now many months out of date), but on the latest business trends, which are not yet known to anyone else. In 1956, in default of satisfactory comprehensive dividend and earnings indices, the *Financial Times* tables had to be used for this demonstration. Now that these series from the 500 share index are available, the same features are revealed, the dividend turning well before the earnings (see Figure 3 where dividend can be seen to turn up in September 1962, and earnings in January 1963). Consequently, there seems no need now to bring up to date the tables derived from the *Financial Times* analysis as any signals they may give are better derived from the 500 share dividend and earnings indices.

33. Finally there are certain systems which compare the progress of a share index with, say, a twelve months' moving average of the same factor. Naturally when the indices are rising the latest figure will be higher than the moving average, whilst in a declining market the current index will be lower. The theory is that when the moving average line cuts the index line a major change is to be anticipated. This system appears to have no economic justification. It is really little different from the " Hatch Theory " which recommends purchases 10% up from the low point of the index and sales 10% below the high point. Both these methods are merely mechanical devices which cannot fail to signal the onset of a substantial upward or downward trend, sometime after this move has commenced. The trouble is that these signals will often be given on the strength of secondary movements which do not persist.

(b) *The Selection of Groups*

34. The group indices show how a representative portfolio of shares in a particular industrial group has fared as to price performance, dividend record and earnings. This, of itself, is no more than historical information revealing in a convenient form what an experienced market operator would know already. The absolute performance of a group index is of little interest; what matters is how it has moved relative to some standard either the 500 or 594 share index, or the capital goods or consumer goods index, etc., whichever is most appropriate. For example, the building group index now stands at 114 as does the 500 share index; hence this group has moved with the market and is not, therefore, displaying any special features. On the other hand, the composite insurance share index stands at 76 so that this group has moved completely against the general trend. This result may well reveal a special situation worthy of further investigation.

35. The analyst who is looking for under-valued and over-valued classes will need to keep charts of some or all of the group indices, watching their performance relative to the whole index. Such charts will probably be maintained weekly as a daily tabulation is scarcely necessary for this purpose. This chart programme would logically start with the " class " groupings (the capital goods, the consumer durables, the consumer non-durables, the chemicals, oil, etc.), comparing their price performance with that of the 500 share index. This series, with its earnings yield, is a more suitable standard than the 594 share index. One method is to chart these five or six series in different colours on the same sheet of graph paper keeping the 500 share index either in heavier lines on the same paper or on an adjacent transparent sheet to facilitate comparisons. A preferable alternative is to chart (class index ÷ 500 share index), thus showing directly the relative performance. An example of this technique is given in Table 1 on p. 395.

36. Table 1 depicts the performance of " capital goods " and " consumer goods " both relative to the All-Share Index from 1953 to 1962 (for this purpose the old Actuaries Investment Index has been used, as the new series does not cover a long enough period). From December 1953 until 1955 " capital goods " went ahead as the boom in capital equipment trades developed, whilst " consumer goods " lagged behind. Subsequently, however, the relative position of capital goods deteriorated whilst that of the consumer trades improved. The Table demonstrates the cyclical nature of the capital

goods trades and shows the scope that exists for tactical switches between this group and the consumer goods classes. This type of operation is surely what was envisaged by Douglas and Murray when planning the original index.

TABLE 1

Capital goods versus Consumer Goods
Group indices ÷ All-Share Index

Date	Capital	Consumer
12/53	·988	1·180
6/54	1·051	1·114
12/54	1·048	1·108
6/55	1·166	1·013
12/55	1·150	·994
6/56	1·099	·934
12/56	1·071	·950
6/57	1·053	·923
12/57	1·000	1·000
6/58	·952	1·010
12/58	·984	1·065
6/59	·956	1·150
12/59	1·010	1·174
6/60	·966	1·217
12/60	·904	1·284
6/61	·902	1·315
12/61	·853	1·379
6/62	·833	1·366
12/62	·819	1·274

37. When a price index for a class diverges from the overall average the reason may be either an increase or decrease of the dividend relative to the average, or alternatively, a change in the market rating of the class. It is important to distinguish between these causes by watching the progress of the dividends and yields. The most convenient way to do this is to chart the " yield relative " being the ratio of the class yield to that of the 500 share index. Changes in this " dividend yield relative " may be due to the variations in the earnings so that it may also be necessary to record the earnings yields in a similar manner. Indices involving earnings, however, need to be interpreted with considerable discretion as a low figure for the earnings yield may reflect either a better growth rating or a decline in the profitability.

In paragraph 32 above the possible value of indices of dividends and earnings was discussed; it was suggested that the dividend

index in particular gives an earlier warning of changing industrial conditions than does the earnings index. Again it is the dividend performance relative to the 500 share index that matters and should be studied on suitable charts.

38. So far only the major class groupings have been discussed. Clearly the individual industrial groups could with advantage receive similar treatment. Their index figures for prices, dividends and yields should be plotted against the most suitable standard which would usually be the appropriate class groupings.

39. The best results from index charts are achieved by plotting them alongside charts of various economic factors depicting the progress of the groups concerned. The *Monthly Digest* has many examples of suitable series—production statistics, numbers employed, orders outstanding, retail sales, hire purchase debts, etc. The *Financial Times* monthly figures of industrial profits, earnings for ordinary, and dividends can also with advantage be studied alongside corresponding index figures. It is clear that the value of the index display is enormously enhanced by keeping the relative figures on well-designed charts. For the large number of industrial groups maintenance of the necessary charts, even on a weekly basis, is an onerous task and it is highly wasteful and uneconomic for all the interested parties to have to set up their own chart library. Clearly there is a case here for some organisation being prepared to design suitable charts, to reproduce them and to issue them on a subscription basis. It is interesting to note that in America an enterprising statistical service provides a continual coverage on a weekly basis of these price relative charts both for industrial groups and for many individual shares. Subscribers receive a new set of charts each week. As an alternative the charts are reproduced on micro film and can be inspected by the subscriber on a suitable projector.

40. An interesting example of the movement of an industrial group index is given in Figure 4 which shows the dividend yield of the electrical engineering group relative to the all industries yield (the figures are taken from the "Airways" 600 share index—see para. 87—available since 1st July 1960). From 1st July 1960 to 31st December 1961 the yield rating of this group was between 1·20 and 1·40, reflecting the poor dividend performance of the leading companies in this trade and the apparently limited growth prospects of their shares. In January 1962 the severe weather and the consequent electricity cuts began to suggest that the capital plans of the Central

ELECTRICAL ENGINEERING GROUP
Dividend Yield Ratio to 600 Share Yield

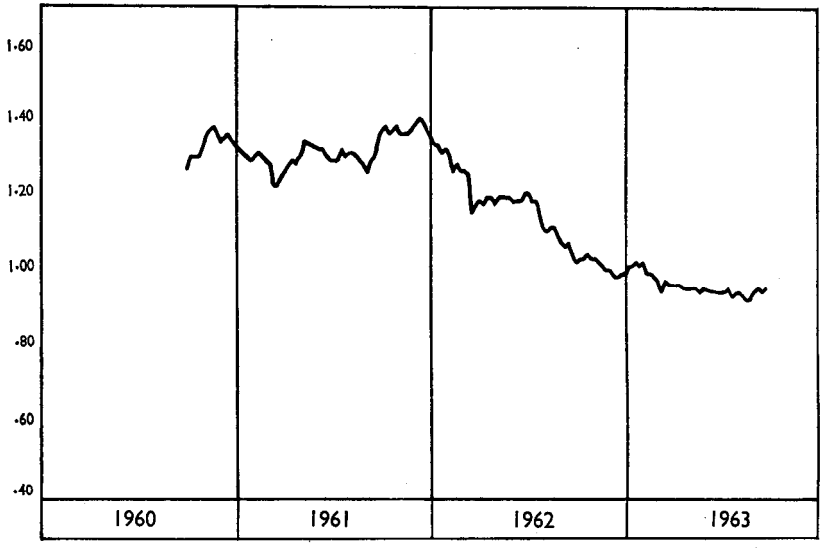

Fig. 4

Electricity Generating Board would have to be enlarged and the rating moved down below 1·20. In June 1962 news of the large new contracts for generating plant, etc., were announced; immediately the yield rating broke through the low of 1·16 and thereafter declined steadily to the present level of 0·95. An analyst watching both the charts and the news of these trade developments might have been able to forecast the spectacular recovery in this group of shares soon after it commenced in June 1962.

Portfolio Performance

41. One of the primary objects of the index is to provide a " standard-portfolio " suitable for checking the results of all types of investment activity. For 200 years actuaries have been constructing mortality tables, and using them to check the success of their methods of selecting lives for assurance. So far, however, there has been little professional interest in the construction of " investment tables " or share indices, designed to check the selection of ordinary share investments—a problem now perhaps of equal importance.

42. The original sponsors of the Actuaries Index (Douglas and Murray) were concerned with tactics and policy rather than portfolio performance. In the previous paper this question was dismissed in a couple of paragraphs. In any event, the original Actuaries Investment Index with its infrequent publication, its limited weighting procedures, and its geometric averaging was a far from satisfactory standard for this purpose.

43. The F.T. 30 share index, however, with its daily quotation has been widely used as a check on the price performance of life funds, investment trusts, unit trusts, etc. Sometimes annual reports mention how much better the results have been than the index. Such comparisons are rarely published when the results are adverse! Now that alternative daily indices are available, the 30 share index should no longer be so used, except perhaps for short term comparisons. Over a period of, say, more than a year the 30 share index will normally lag behind wider-based and more representative series because :

(1) The geometric averaging makes for a downward bias.

(2) The shares concerned, having been selected 30 years ago, are not perhaps fully representative of the new and growing industries.

(3) The 30 constituents largely representing the industrial " giants " may have below average scope for growth, merely because of their size.

44. In fact, former index techniques, designed for manual computation, simply did not permit the construction of a daily index acceptable as a performance standard. The new F.T.-Actuaries Index does, however, represent a " standard portfolio " invested in some 500 equities, each holding being proportionate to the market valuation of the company concerned. This " portfolio " is kept up to date by subscribing to all rights issues and substantial new flotations, raising the money required by selling equal fractions of all earlier holdings. The investment policy is similar to that of an institution which holds a percentage of the capital of 500 equities and has sufficient new money to take up all rights and subscribe for new issues, but which never sells existing holdings. Such a portfolio, with its passive non-selective policy, should form an excellent standard against which the results of managed portfolios can be measured.

45. The existence of a reliable " standard portfolio " introduces a new and stimulating discipline into investment management. It may well become normal actuarial practice to check not only the mortality experience, but also the investment performance. Like mortality figures affected by unexpected claims, the results will fluctuate from year to year, due perhaps to a few poor investments. Hence, results of a single year will have little significance ; if, however, year after year, the performance of a managed portfolio continues substandard, surely there is something wrong with the policy, the day-to-day management or both !

46. This valuable discipline should also be applied to other types of investment work. In a stockbroker's office the statistical department may be responsible for a steady output of recommendations for purchases or sales. Financial journalists, writers of weekly news letters, investment counsellors, etc., perform similar services. When the objective is merely short-term capital gain, the value of all those recommendations can now be readily checked, by allowing, say, 12 months to elapse and then scaling the prices at the date of the suggestion up or down by the movement of the index, comparing the result with current market prices. It is to be hoped that the " purchases " will perform better than the index, and the " sales " somewhat worse : if the reverse situation obtains, the authors of the recommendations can scarcely escape criticism.

47. When clients' portfolios are managed by a Trustee Office, a Merchant Bank or a stockbroker, the performance should be checked against the index at intervals. Investment Trusts and Unit Trusts, which have traditionally been using the " F.T." for comparisons, will usually find it much more difficult to " beat the index ", if the F.T.-Actuaries is used as the standard. For these classes, the emphasis is more on the long-term results, so that any tests of performance must allow suitably for dividends as well as capital. Space does not permit of a discussion in detail on the methods of checking portfolio performance. The procedure as regards a growing pension fund is described in the *Investment Analyst*, No. 3, August 1962, " Measuring Ordinary Share Portfolio Performance " by A. B. Gilliland. This excellent article shows how to compare each quarter both the capital and income performance with a suitable index standard. It is important also to study the yield on the market values. Clearly an investment policy, directed towards the lower-yielding " growth " shares, should secure above-average growth in capital and income: this result may not necessarily be better than that of an alternative portfolio, with less growth but higher income. There is considerable scope for research into methods of comparing the results of high- and low-yielding portfolios, allowing for capital and income combined.

Historical Studies

48. Two important index applications are:

(*a*) Assessing the yield gap between gilt-edged and equities, and

(*b*) studying the long-term progress of equity prices and dividends compared with other factors such as wage rates, living costs, etc.

The first application requires a long-term dividend and earnings yield series. With a narrowly based index of say 30 shares, changes in dividend and earnings from a single constituent company, following its annual report, may make a significant difference, introducing a distinct break in the figures. For continuity over a long period the constituents need, if possible, to be left unaltered. If, perhaps following a takeover, a constituent has to be replaced, the new one is most unlikely to carry the same dividends and earnings yields as the old one. Hence such a change makes again for a break in both dividend and earnings series. As changes are such a nuisance they are best kept to a minimum with the result that the constituents become outdated and unrepresentative. This is, in fact, now the case with the F.T. 30 share index which includes an excessive proportion of con-

stituents from the engineering and textile trades with above average dividend yields and probably sub-normal growth prospects.

The effect of these constituents on the yield at 1.11.63 is shown below :

	Dividend Yield	*Earnings Yield*
	%	%
30 share . . .	4·53	5·82
500 share . . .	4·13	7·19
Oil group . . .	5·56	13·20
500 share ex oil . .	3·95	6·43

49. As the 30 share index does not include the high-yielding oil shares, these are best removed from the 500 share index before making the comparisons. By reference to the adjusted 500 share index the smaller index shows a dividend yield some ½% higher and an earnings yield some ½% lower. Consequently, any attempt made to bring the 30 share constituents up to date would automatically mean replacing some of the high-yielding capital goods shares by lower-yielding constituents ; the result would be that the dividend and earnings yields would change sharply, probably in opposite directions. Such changes would probably destroy all confidence in the index as a yield criterion.

50. In contrast the 500 share index with its automatic procedure for keeping the constituents up to date is likely to prove much superior as a yield standard. With the very large number of shares involved changes among the individual constituents have a negligible effect on the overall result. By the use of weighted averages, kept automatically up to date with capital changes, yields are maintained as thoroughly representative of the returns available from a comprehensive sample of U.K. industrial shares.

51. The second application, comparing share prices with wage rates, etc., was dealt with in the previous paper (see Table 5, p. 401 *T.F.A.* vol. 23 and p. 351 *J.I.A.* vol. 82). An up-to-date version of this Table is now reproduced on p. 402.

For the Actuaries Index mid-year figures are taken. The figures for the other four series are yearly averages of monthly figures. The figures for wages differ slightly from those given in the earlier paper, as this series was revised in 1958.

The F.T. 30 share index has replaced the London and Cambridge index, discontinued in 1950. The earlier table showed how by 1955 the old Actuaries Index had fallen behind both the London and

Cambridge and the *Investors Chronicle* indices; for the next seven years this lagging tendency still obtained. Probably the sub-normal long-term performance of the Actuaries Investment Index is due to inclusion of railway shares up to 1948 and to the heavy weighting given to the slow moving tobacco group thereafter. The I.C. index shows the greatest appreciation over the 33 years. This spectacular price performance is to some extent explained by the method of averaging (arithmetic for I.C., geometric for F.T.). Over the whole period ordinary share prices as measured by the I.C. index and the F.T. index appear to have outpaced retail prices and wages. This statement must be treated with some reserve, however, as the choice of the base year of 1930, when equity prices were so low, contributes considerably to this result.

TABLE 2

Share Prices, Costs and Wages

Year	Actuaries	*Financial Times*	*Investors Chronicle*	Retail Prices	Wages
1930	100	100	100	100	100
1935	103	124	120	91	97
1940	52	89	65	118	119
1945	114	149	152	147	159
1950	102	144	140	180	196
1955	176	253	241	240	268
1956	153	235	216	251	288
1957	174	245	230	261	303
1958	158	236	239	269	312
1959	210	324	355	270	321
1960	257	414	453	273	327
1961	277	415	508	282	341
1962	230	371	483	294	351

52. The 500 share index is, of course, too " young " for any long-term comparisons to be made. Nevertheless, it is interesting to see how it has progressed so far relative to the other important indices. In the following table all the other indices have been re-calculated to a common base of 100 on the 10th April 1962. (Table on p. 403).

The poor price performance of the 594 share index is readily explained by the continued weakness of the financial group (for this class the index in November 1963 was no more than 82 compared with 115 for the 500 share index). The *Daily Mail* index includes some financial shares and thus shows a somewhat lower figure than both

The Times and the " 500 share ". The latter two indices have kept close together over the whole period. To some extent the lead shown by the 500 share index may be ascribed to the oil shares which carry a weight about one-ninth of the whole "portfolio ", and have performed much better than the average. The index for this group at 1st November 1963 is 149 compared with 115 for the 500 share index. Ignoring oils, the 500 share index at around 112, would be some 3% lower, just under the 30 share result.

TABLE 3

Date	F.T. 30 share	*The Times*	*Daily Mail*	F.T.-Actuaries	
				500 share	594 share
1.5.62	100·23	100·19	101·58	101·00	102·19
1.8.62	85·06	87·67	88·37	87·97	86·87
1.11.62	90·08	92·08	91·59	92·74	91·22
1.2.63	95·17	98·75	98·36	98·98	95·11
1.5.63	101·89	103·75	102·53	103·97	98·87
1.8.63	101·99	104·50	102·34	105·36	99·51
1.11.63	113·30	114·78	108·91	115·24	107·26

53. The authors were distinctly surprised at this result, as they expected that the geometric averaging of the smaller index would have given it a downward bias relative to the new series. To explain this situation some calculations have been made based on the 30 share index, details being given in the Appendix. For this purpose price relatives adjusted for capital changes, etc., were taken for the 30 constituents from the weekly statistics of the "Airways" index, the relative dates being 11th April 1962 and the 6th November 1963. Then the unweighted geometric average of these relatives was calculated, the result being 1·1246. Multiplying this figure by the index on the 11th April 1962 (305·3) gave a figure for the index on the 6th November of 343·3 compared with the published figure of 343·8. From this material it is easy to re-calculate the 30 share index on the 6th November on alternative assumptions :

	Price Relative	*Index*
1. An unweighted arithmetic average. .	1·169	357
2. A weighted arithmetic average . .	1·204	368

The 30 share index, if arithmetically averaged, would be standing some 14 points higher. The alternative weighted average is not a

very suitable measure for a narrowly based index as it is unduly influenced by the above-average performance of the larger constituents. Imperial Chemicals with a price relative of 1·299 has a market value of £900 million, almost one-fifth of the total value of the 30 constituents. Woolworths, with a market value of £600 million also shows an above-average appreciation with a price relative of 1·249. From the figures given in the Appendix it will be seen that the leading constituents, from the point of view of price performance, are :

	Price relative on 6·11·63
G.E.C. . . .	2·289
P. & O. . . .	2·277
Courtaulds . . .	1·742

These three shares with their spectacular performance over the period concerned have had a distinct influence on the index. If, instead of these particularly successful constituents, other companies had by chance been chosen with a performance no better than the average, the 30 share index would now be 6½% or some 23 points lower than the current level of 343. Hence it appears that the close coincidence of the 30 share index with the 500 share one (less the oils) may be due to special circumstances and is unlikely to persist in the future.

Economic Surveys

54. There is much talk in political and economic circles of a planned economy where wages, profits, dividends, etc., will be controlled in line with the progress of national productivity. Certain European countries, notably France and Sweden, have attempted to plan their economies this way.

55. The first requisite to any scheme of this sort is a proper statistical coverage of all the factors involved. The progress of wages can be readily followed from the Ministry of Labour indices as well as from Trade Union and industry statistics. Profits and dividends, however, are not so conveniently tabulated and some confusion exists regarding the best indicators to use for these factors. Sometimes Board of Trade or Inland Revenue statistics are quoted : alternatively, reference may be made to the *Financial Times* monthly analysis of company accounts or to the corresponding quarterly tables of *The Economist*. Information from all these sources, however, is most misleading if used for comparison with wage changes, as all

these figures ignore the earnings on the new capital that is being raised from shareholders. Surely the more correct picture would be obtained by studying the movement of earnings and dividends received by those shareholders who maintain their original stakes without finding any new money. The only source of such information is a properly calculated and weighted index covering sufficient companies so as to represent an important section of British industry. In Table 4 below profits and dividends are shown from 1960 to the present time both by the F.T. tables and by the most comprehensive index that was available over the period concerned (the "Airways" 600 share index which commenced on the 1st July 1960).

TABLE 4

Profits, Dividends and Wages
(based on a figure of 100 for the year 1960)

Date	F.T. Tables		"Airways" Indices		Wages
	Net profits for Equity	Net Dividends	Earnings	Dividends	
(1)	(2)	(3)	(4)	(5)	(6)
1.1.62	106·0	112·5	98·7	104·0	104·1
1.1.63	95·6	116·0	85·0	104·3	107·1
1.11.63	96·3	123·1	87·0	107·0	109·7

Columns 2 and 3 above have been calculated by taking the ratio between the cumulative figures for January to December from one year to the next as the links in a chain index. The "Airways" figures are earnings and dividend indices recorded at the dates concerned relative to the corresponding figures at 31st December 1960.

56. Whilst the F.T. tables show dividend increases of some 3% during 1962, the more correct assessment based on the index reveals that dividends were in fact frozen during that year. From January 1961 to November 1963 the annual growth rate of dividends measured by the index is no more than 2½%, compared with 8% per annum shown by the F.T. tables. From column 6 it is clear that wages continued to rise over this period despite the fall in earnings and the one year "dividend freeze".

57. Whilst the figures in columns 4 and 5 above reflect correctly the experience of the equity shareholder, it is arguable that this may

not be the proper criterion to use when concerned with national economic planning when the problem is one of " dividing the cake " between capital and labour. For this purpose a more correct concept is the return by way of earnings and dividends on a fixed amount of equity capital or " capital employed ". On this basis in a static economy with national production, wages, and the return on equity capital constant, the shareholder would nevertheless receive some additional income from the earnings on the capital ploughed back. This additional income would, in fact, be no more than a recompense for conservative dividend pay-outs in previous years. If this theme be accepted, then in a year like 1962, when overall dividends are frozen, the shareholder is not just maintaining his position, but is actually taking a cut in the return on his capital employed. At present no satisfactory figures exist to measure the return on capital employed, so that discussion on this subject is somewhat academic. The authors consider that the return on capital employed is a strong candidate for inclusion in the index display, as this feature is valuable for investment analysis as well as for economic studies. This question is discussed further in Part IV below.

58. In due course, as its history builds up, the 500 share index should be used as a guide for economic planning. For this special purpose it must be admitted that the oil shares would be better eliminated as they carry considerable weight and with their trading operations largely outside this country their activities have little influence on the U.K. economic scene. Consequently, consideration might be given to producing at, say, monthly intervals an adjusted index without the oil shares.

Approximate Valuations

59. In the past the index has been used for making approximate valuations of institutional ordinary share portfolios. Accurate valuations would be made at annual or half-yearly intervals and the index figures, used if necessary in groups, would be employed to carry these valuations forward month by month and so give approximate valuation figures at intermediate dates. This process did, in fact, usually work with reasonable accuracy if proper adjustments were made for the profits and losses on sales and for the cost of purchases.

60. For many institutional portfolios, market values are at present well above book values, following the appreciation of the ordinary shares, so that frequent valuations are no longer so necessary. In addition more and more institutional portfolios are now being valued

by computers so that the value of the index for these purposes is much lessened. One such application does, however, remain. In assessing the break-up value of investment trust shares the published market values at the latest accounting date need to be brought up to date by the use of indices. With world-wide portfolios it is necessary to apply the appropriate national indices to the different sections of the portfolio. The new and more comprehensive weighted index should be a much better measure than the F.T. 30 share index for this purpose. In particular, the 594 index has the advantage of including oil shares, insurance shares and bank shares none of which appear in the 30 share series.

Preference Share Indices

61. These indices are useful as a guide to the investment policy to be adopted towards fixed interest securities. It is instructive to maintain a table or chart showing the long-term comparison between preference share yields and the returns on undated gilt-edged, taking for this purpose 2½% Treasury. Table 5 on p. 408 sets out this comparison for the last five years of the old preference index. These figures can be used as a standard for the new series as the methods of construction and the constituents have hardly changed.

Over the five years 1958 to 1962 inclusive the preference/gilt edged yield ratio has varied between a " high " of 1·27 on 29.7.62 and a " low " of 1·09 on 27.6.61. With these wide variations in the relative yields there is some scope for switches between these two classes, selling preference shares against undated gilt-edged when the ratio is around 110 and reversing the transaction when the high figure of 125-127 is reached.

The present margin between these yields is some 13% (November 1963). In considering this margin it must be borne in mind that the index yield is based on middle prices and ignores expenses. For the yield to a buyer it is necessary to reduce the index figures by some 4%. Hence the difference between the buyer's yield on preference shares and on gilt-edged is at the moment no more than, say, 9%. Such a margin is low bearing in mind the lack of marketability and the degree of industrial risk associated with the shares. It is surely quite inadequate for a gross fund as, to these industrial risks, etc., is added the possibility of an adverse net U.K. rate which, if it falls to 5/9d., involves a 10% loss of income and absorbs all the margin.

62. The investment trust preference index now always shows a higher yield than the industrial share preference index. At first sight

this is somewhat surprising because trust preferences are normally regarded as of higher quality than industrial issues. The explanation lies in the low net U.K. rates applicable to the trust preference shares which have the effect of making them unsuitable for gross funds and unattractive to many " life and annuity " funds.

TABLE 5

Preference and Gilt-edged Yields

Date	Preference Yield	Treasury 2½% Yield	Ratio (1) ÷ (2)
	(1)	(2)	(3)
25.3.58	6·36	5·29	1·20
24.6.58	6·40	5·11	1·25
30.9.58	6·21	5·00	1·24
30.12.58	6·22	5·12	1·21
31.3.59	6·18	5·07	1·22
30.6.59	6·21	5·06	1·23
29.9.59	6·17	5·28	1·17
29.12.59	5·76	5·28	1·09
29.3.60	6·03	5·48	1·10
28.6.60	6.52	5·75	1·13
27.9.60	6·58	5·78	1·14
28.12.60	6·59	5·88	1·12
28.3.61	6·90	6·15	1·12
27.6.61	7·13	6·55	1·09
26.9.61	7·60	6·65	1·14
27.12.61	7·60	6·71	1·13
27.3.62	7·31	6·29	1·16
26.6.62	7·35	6·30	1·17
26.9.62	7·02	5·61	1·25
27.12.62	6·73	5·66	1·19
Average	6·64	5·71	1·17

63. The index could, with advantage, be used for pricing the occasional important preference share new issue. A more frequent application lies in determining the attraction or otherwise of market offers of preference shares. For example, the index figures may suggest that the margin between the gilt-edged yield and the yield after expenses of purchase of good quality preference issues is some 9% to 10%. If a buyer insists on say 20% above the gilt-edged yield only inferior stocks will normally be obtainable.

64. The question arises whether the preference share index, being more or less identical with the old manual series, calls for any

development in the light of the electronic facilities now available, which can allow automatically for any number of added refinements if these should prove of value to investors. Examples of such refinements are :

(*a*) Separate indices for high and low coupon stocks.

(*b*) Special indices for shares with a full 7/9d. rate of net U.K. Tax.

(*c*) A degree of weighting by size of issue.

(*d*) Some classification by quality as measured by the dividend cover.

Consideration might be given to enlarging the list of constituents, as 15 or 20 shares are scarcely enough to make a reliable average, if even a single constituent should deteriorate in status.

Redeemable Debentures

65. The present series is in much the same form as the manually computed index, published by the actuaries since 1957. Now that institutional portfolios can so readily be valued by the computer the original purpose of this display—making approximate valuations—has largely disappeared. The price index as published, is of little use for timing purchases or pricing issues as the term of the stock concerned will usually differ from the twenty-year period used for the index. In the circumstances, this index seems to serve comparatively little purpose and unless some members have strong views and use it frequently the series might be discontinued. Before taking this step, however, some thought should be given as to whether any more useful service should be provided, such as the average redemption yields. This indicator, which can now be so readily calculated by the computer, would be of distinct value in demonstrating the gap between gilt-edged yields, as shown by the Government stock index, and debenture yields and hence possibly facilitating policy decisions regarding debenture purchases. The main difficulty lies in the very limited market in almost all debenture stocks once they are fully paid and subject to stamp duty. Only the largest issues show daily dealings in the Official List ; for the majority of debentures jobbers quote 5 or 10 point prices which are only rarely changed. More frequent dealings occur in those issues where there is a substantial sinking fund but such stocks are likely to have unrepresentative yields and need to be excluded from an index service. The reduction in stamp duty from August 1963 has made for more active dealings in these stocks, and narrower price quotations. In these circumstances the possibility of redemption yield averages might be reconsidered.

THE GOVERNMENT SECURITY INDEX

66. Like the redeemable debenture scheme the Government Security Index is designed to reflect the experience of dated stocks with an outstanding term to maturity of 20 years. Yield comparisons cannot be made as the debenture index deals with price movements only. The relative price performance can, however, be studied and at the time of writing the position is as follows :

	Price Indices		
	on 1.11.63	"*High*"	"*Low*"
Debentures . .	113·01	113·43 (23.10.63)	98·98 (3.7.62)
20-year Government	114·23	115·42 (11.9.63)	99·91 (11.5.62)

As would be expected by comparison with gilt-edged, the debentures are rather less volatile and their "highs" and "lows" occur somewhat later.

67. Another application of the Government Security Index is to make a comparison between the 20-year yield and the Consols yield. Such a comparison reveals the slope of the yield curve from the 20-year point onwards and may in time develop into a series of some historical interest.

68. Whilst the debenture index may still be used by some investors to make approximate valuations, no such application can be envisaged for the gilt-edged index as an accurate valuation of the few stocks involved can always be made so readily.

69. The authors are of the opinion that the mere calculation of the 20-year Government stock yield by a crude process designed for manual calculation is scarcely making proper use of the electronic computer. This single yield gives only a very limited picture of the gilt-edged scene and will scarcely ever be used by institutional holders of gilt-edged whose statistical needs are already so fully catered for by the extensive records kept by the leading firms of stockbrokers specialising in gilt-edged. The daily redemption yield list obtained from these stockbrokers is often kept in a file so as to provide the full story of relative redemption yields for stocks of different terms over the years. From these records of redemption yields the yield curve (the redemption yield plotted against the term) is readily obtained. This yield curve if recorded at, say, monthly intervals provides practically all that is likely to be needed for historical and tactical studies of the gilt-edged market.

70. In the circumstances the question arises as to whether the gilt-edged index service should not be extended to include a calculation of the yield curve and the publication of redemption yields at, say, quinquennial intervals throughout the list. The procedure for using an electronic computer to fit a curve to the redemption yields of Government stocks has been fully described in a recent paper submitted to the Institute by G. T. Pepper.

Part IV

FURTHER DEVELOPMENTS

71. With the electronic computer there is no need to limit the index display just to prices, dividends and earnings. There are several other factors, used in investment analysis and in economic research, which could with advantage be included in the programme. The most important factor is the " assets per share " ; others that merit investigation are the depreciation per share, the " cash flow ", the level of stocks, and the capital expenditure. These items might perhaps be the subject of a special monthly tabulation, as they do not change quickly enough to justify daily tabulation.

72. If the " assets " (i.e. assets per share) were tabulated, much valuable analytical material would become available. The ratio (assets ÷ price) denotes the goodwill element in the share valuation, and allows for interesting comparisons between different companies in the same industry, and between various industries. (Earnings ÷ assets,) and (dividend ÷ assets) reflect the returns obtained on the capital employed in the business and are important factors in assessing a company's prospects. In addition, these ratios may have important social and political implications, as mentioned in paragraph 57 above.

73. The ratio (assets ÷ price) has a further interesting application. It is one of the components of the earnings yield as shown below :

$$\text{Earnings yield} = \frac{\text{assets}}{\text{price}} \times \frac{\text{earnings}}{\text{assets}}$$

So far, little is known regarding the use of earnings yields in investment analysis. Now that earnings yields have become part of the index display, a new field of research is opened up, investigating questions like the relation between past earnings yields and subsequent performance. Such studies could well be facilitated by

examining the components of the yield; for example, splitting up index constituents into those with either

(*a*) substantial assets carrying a low return, or

(*b*) low assets employed more profitably.

74. A possible technique is to construct an index of asset values, commencing at 100 on the base date, with earnings yields and dividend yields on these assets. The whole scheme would be similar to the existing display, with asset values substituted for prices. If such an asset value index was indeed available over a period of years, it would be most instructive to compare its performance with that of the price index under different economic conditions. Probably the ratio (asset index ÷ price index) would display interesting long-term trends, reflecting changes in the profitability of industry and in shareholders expectations. The "highs" and "lows" of the ratio, occurring presumably at low and high points of the trade cycle, might well be a useful additional guide to the timing of equity purchases.

75. It will be seen that the (assets ÷ price) ratio is always the significant factor. In these circumstances it is clearly better to work direct on this ratio, rather than to use the asset index. The ratio would be calculated for each constituent as well as being averaged for each group and for the whole index. The progress of this ratio is clearly more informative than the progress of the assets alone: the ratio, being dependent on price, is more responsive than the slowly changing asset index.

76. The other three factors, the cash flow, the stock level and the capital expenditure can also with advantage be calculated as a percentage of the price, thus giving a convenient standard for comparison between different companies and between the different industries. To demonstrate this scheme in practice the authors have been permitted to reproduce some interesting experimental calculations made by the B.O.A.C. Investment Department, using the computer to analyse the accounts of the 600 shares covered by their index. In November 1963 the total valuation of the 600 shares was £13,525 million, about half the total valuation of all quoted equities. For these 600 companies the following factors were obtained. (Table on p. 413).

77. This investigation shows that over the year 1962-3 for an important comprehensive sample of U.K. industry the net cash flow of 5·5% was distinctly less than the capital expenditure of 6·7%. For 1963-4 the capital expenditure is likely to increase from the relatively low level that obtained in 1962-3 whilst the stock item,

which is some five times the cash flow, may readily rise by some 10 to 20 per cent with increasing production. Hence it is not unlikely that U.K. industry will make considerable demands on the national economy for finance, either by way of increased bank advances or by stock or share issues. Similar investigations carried out for the various industrial groups may well have equally interesting economic, social and market implications.

	Percentage of total market valuation of 600 *Equities*
Gross cash flow i.e. Net earnings for equities + depreciation	8·0
Dividends (gross)	3·97
Net dividends	2·48
Net cash flow	5·52
Assets for Equity	61·0
Net equity earnings	4·4
Stocks	28·3
1962-3 Capital expenditure	6·7

$$\text{Net earnings on capital employed} = \frac{4{\cdot}4}{61{\cdot}0} = 7{\cdot}2\%$$

Part V

INVESTMENT ANALYSIS BY COMPUTER

78. This is a fascinating subject which should in due course form the subject of a major contribution to the literature of the profession. Whilst any lengthy discussion on this theme is at present inappropriate, it is nevertheless important to draw the attention of members to the invaluable facilities that the electronically computed index with its mass of stored investment statistics offers towards the solution of this problem.

79. First it is necessary to clear up some misunderstandings about investment analysis. On this subject there are two conflicting schools of thought. One group of analysts pays considerable attention to the past performance of companies, translating previous results into trends which are projected forward, thus attempting to forecast future progress. The other school maintains that past performance is largely irrelevant and bases their assessment on " visits to the plant ", interviews with the chairman, market research analysis and a close study of economic trends affecting the company.

The authors believe that the proper technique involves a study of both methods and a combination of their results. Sometimes one system is appropriate, sometimes the other, sometimes both.

80. In his paper entitled "Higgledy Piggledy Growth", Mr. I. M. D. Little of Nuffield College, Oxford, maintained that there was, if anything, only a negative correlation between the past performance of a company and the future growth of its profits. There is, in fact, some economic justification for this theme as exceptionally favourable growth of a single company is often terminated by the increase of competition that this very success ensures. Conversely, poor results may improve as competitors drop out of an apparently unprofitable market. Hence a favourable or unfavourable trend carries within itself the seeds of its destruction.

81. These economic generalisations should not, however, be applied on too wide a front. Some trades admittedly are so competitive that results of companies engaged in them naturally fluctuate from year to year, past performance being thoroughly irrelevant to the future. In other trades, however, results are governed by reliable trends based on:

(*a*) long-term contracts,

(*b*) loyalty of customers to well-known brands,

(*c*) a carefully selected trade concentrated on the more profitable portion of the market.

82. Finally, the most important factors affecting results are those due to a management of above- or below-average ability. Altogether, there are many trends, which can be revealed by investment analysis and which are likely to continue, provided there has been no change in the conditions that produced them. This subject of past trends and their relevance to the future has been discussed in a recent Institute Paper by G. T. Pepper. Here Pepper classified the trends in gilt-edged price ratios between pairs of stocks into those that are

(*a*) permanent, being caused by definite features of the stocks,

(*b*) movements due to changing interest rates etc. which may be reversed,

(*c*) fluctuations.

Surely the same principles apply to ordinary share analysis. The same three groups of trends can be distinguished—those that are likely to continue, those that may reverse and those that are due to short-term fluctuations in industrial profitability. The skill of the

analyst lies in distinguishing between these three types of trends and making the correct interpretation from them as to the future progress of the share.

83. So far, the discussion has been confined to the relation between past results and future profit progress. An even more important factor is the relation between past results and the present yield basis of the company concerned. Whatever its impact on future progress, past performance is an essential factor in the market valuation of a share. Usually a company, with an above average past record of steady growth, will be highly rated by investors, and will carry a below-average yield ; with a poor past record, the converse applies. Altogether the analyst's task is to :

(*a*) study the past record,

(*b*) distinguish between conflicting trends,

(*c*) decide whether a trend that is likely to continue has or has not been fully discounted in the present yield basis.

84. The computer, fed daily with the statistics for the index, could in due course, build up a history of price, dividend and earnings " relatives " which would be a useful guide to the past record of individual companies (item (*a*) above). At the same time it could produce weighted means of these factors for the groups and for the whole index, thus setting up a standard with which these individual results could be compared.

The periodical display might be as follows. (Table 6 on p. 416).

85. The analyst could derive considerable value from ranking the constituents in order of their past performances and comparing this ranking with that obtained from the dividend yield averages (taking the latter in the reverse order). The extent to which this past " performance ranking " differs from the yield ranking denotes the effect on the market of the current outlook for the share concerned and should be a valuable guide to special situations. At the same time, this technique might also be applied to a study of the performance of the group index compared with the 500 share index.

86. A further clue may be obtained from examination of the " yield ratings ". This factor for a constituent is the ratio of the present dividend yield to either :

(*a*) the dividend yield on the whole index,

(*b*) the dividend yield on the group.

The traditional technique involves calculating weekly the ratings

for each constituent, recording " highs " and " lows " of these factors. When after two or three years a sufficient history has been built up, the current rating is used as a guide to see whether the share is historically cheap or dear in terms of relative yield. Formerly, owing to the lack of satisfactory group indices, ratings were usually taken against the yield on an all-securities index, usually the F.T. 30 share index. For the new indices, ratings relative to the group yields would usually be the more valuable (except for miscellaneous classes where the overall average is probably more appropriate).

TABLE 6

(A) *Constituents and Groups*

For every group :	Constituent	" Relatives " to Base Date		
		Price	Dividend	Earnings
	1 2 3 :			
Weighted means for the group				

(B) *Groups and the Whole Index*

Group	" Group relatives " to Base Date		
	(1) Price	(2) Dividend	(3) Earnings
1 2 3 : 30			
Weighted mean of relatives for 500 share index			

87. Important pioneer work, demonstrating how a computer can be used simultaneously for index calculations and for analysis, has been done by J. G. Blease, B.Sc.(Econ.), the Investment Officer the B.E.A./B.O.A.C. Joint Pension Funds. The whole procedure is described in the *Investment Analyst*, No. 1, November 1961. In the following paragraphs some figures, taken from the records of the

"Airways" 600 share index, have been used to demonstrate how the technique described above is being applied in practice.

TABLE 7

Brewery Shares at 16.1.63

Item	Constituent	A	B	C	D	Weighted Group Averages
1	Price Relative	1·241	1·180	1·001	1·946	1·180
2	Div. Relative	1·333	1·111	1·100	2·000	1·299
3	Earnings Relative	1·335	1·336	1·054	1·788	1·147
4	Div. Yield	4·38	3·90	5·08	3·71	4·21
5	Earnings Yield	7·60	7·30	8·90	8·60	7·40
	Dividend Yield Ratings to Whole Index					
6	Now	·99	·88	1·15	·84	·95
7	High since 1960	1·33	1·08	1·17	·90	1·00
8	Low since 1960	·90	·73	·89	·61	·80
	Dividend Yield Ratings to Brewery Average					
9	Now	1·04	·93	1·21	·88	—
	Earnings Yield Ratings to Whole Index					
10	Now	·94	·90	1·10	·94	·91
	Earnings Yield Ratings to Industry Average					
11		1·03	·99	1·20	1·16	—

Items (1) to (3) are based on a figure of 1·00 in 1st July 1960.

In the case of the "Airways" index, the weighted group averages of price, dividend and earnings relatives are the appropriate index figures based on the experience of all past constituents of the group rather than specially calculated means, using the relatives for present constituents. As this particular index used fixed weight principles, with changes restricted to "casualties", this distinction is not usually of great importance. Where an important casualty has occurred (as in the Motor group following the Ford take-over), the proper figures can be readily calculated from the up to date relatives tabulated so conveniently each week.

88. For the whole 600 share index, the average dividend yield was 4·42. This figure, divided into the dividend yield of the constituent is the rating (item 6). High and low values of this factor are automatically produced by the computer, new extreme values being recorded as they occur. For the dividend yield ratings to the industry average, and for the earnings ratings the "highs" and "lows" have

not been recorded by the computer, and need to be established by manual methods. With a consistent group like Breweries, ratings are best examined against the industry average (4·21). With a less homogeneous group, however, the 600 share index is the more suitable standard.

89. The following examples from Table 7 above show how the " ratings " and " relatives " are used for analysis. Constituent C shows sub-normal past growth : in recognition of this, the dividend yield is 5·08 against 4·21 for the group and the rating (industry) is 1·21. Conversely, D with an above-average performance records a sub-normal yield and rating (3·71 and ·84). In both these cases, past results may well have been discounted in the present yield basis. On the other hand, constituent A with a rather better than average performance, has a high yield. The reasons for the discrepancy call for further investigation.

90. Three years is, in practice, too short a period to form a reliable guide to past performance. Rather than wait several years before using this material, it would be preferable to calculate manually the necessary " relatives " from a suitable earlier base date to the 1st July 1960, when the "Airways" index commenced. These relatives, once incorporated in the computer memory, would enable it to produce weekly the price, dividend and earnings relatives for 5- to 10-year periods.

91. A weekly display like this, with eleven statistics for each of 600 shares, suffers from the congenital defect of many computer projects, in that the output is so extensive that a large staff is needed for proper interpretation. There is much scope for research work here to devise methods of programming the computer so that it filters the output, concentrating its attention to those situations of particular interest to the analyst. The "Airways" scheme does, in fact, include a system of " signals ", whereby all new " highs " and " lows " occurring each week are printed out on a special list. The computer can, of course, be programmed to draw attention to any other trends of features, such as for example a company whose rating (industry) has moved in the same direction for say six consecutive weeks.

92. So far discussion has been confined to the traditional methods of investment analysis, methods which have been developed for manual computation. The authors believe that the time is not far off when more powerful methods of analysis will be employed. For example, the detailed technique of investment analysis described by

Messrs. Weaver and Fowler in " The Assessment of Industrial Ordinary Shares " (*J.I.A.* vol. 82, p. 243) may in due course be carried out by a powerful computer having sufficient storage capacity for the many details of past history that are needed. An alternative process particularly suited to the computer is that described by J. R. Hemsted in " The Expected Yield of Ordinary shares " (*J.S.S.* vol. 16). Hemsted showed that given the ten-year history of assets per share and earnings on these assets it was possible to deduce the likely growth rate of future profits. It must be emphasised that for any such methods the computer would merely perform the arithmetic and assemble the necessary facts. It would, of course, be left to the analyst to make a considered judgment of the future prospects based not only on these past records but on careful consideration of the latest information regarding the progress of the company concerned and of the corresponding trade or industry.

93. By using either of the methods indicated above it is possible to assess for a particular share the following factors :

r, the estimated growth rate for the next few years of profits,

σ_r, the variability of this growth rate,

d, the proportion of profits likely to be distributed as dividends.

With these factors available for a large number of shares a multiple correlation analysis may be undertaken relating these three factors to the price earnings ratio R, resulting in a regression equation of the form :

$$R = K + K_1 r - K_2 \sigma_r + K_3 d$$

Having established this formula, based on say 100 to 150 shares, price earnings ratios can be readily calculated for a large number of companies and compared with the actual current figures, thus showing whether market prices of the shares concerned are cheap or dear in terms of analysed prices. Naturally in many cases an exceptional situation may be readily explained by special features such as a likely take-over deal, etc. Where, however, no such explanation can be found, any discrepancy between the market and the analysed prices will call for investigation and may disclose interesting investment propositions. The whole procedure is not greatly different in principle from the modern methods used for managing a gilt-edged portfolio whereby the electronic procedures reveal the market anomalies for the analyst to study in detail. It is interesting to record that the technique described above is at present being used in the U.S.A. by

the Investment Department of the Bank of New York. For fuller details reference should be made to the article entitled " A New Tool for Investment Decision Making " by V. Whitbeck and M. Kisor, published in the *Financial Analysts Journal*, May-June 1963.

CONCLUSIONS

94. The new index represents a very considerable advance over the earlier Actuaries and F.T. series and should be widely used for checking portfolio performance and formulating investment policy. It also has considerable applications for long-term historical studies and for purposes of economic and social research.

95. With little additional effort the index coverage could readily be extended to include factors needed for investment analysis (asset values, cash flows, capital expenditure, earnings on assets, etc.). The authors believe that index treatment of these features of company results would be of considerable value to investment analysts.

96. The present index involves the assembling of an impressive volume of investment statistics, automatically maintained up to date each day. If the service were in fact extended to include the additional features mentioned above, and if the resultant material were satisfactorily stored on magnetic tape, the investment statistics built up over a suitable period would provide all the raw material from which a detailed investment analysis by computer could be undertaken. The whole question of further developing the index coverage and making proper use of the index statistics is a most fruitful field for research by members of the profession.

APPENDIX

The Constituents of the F.T. Index on 6.11.63

	Price relative to that on 11.4.62	*Market Valuation in £ m.*
A.P.C.M.	1·227	138
London Brick	1·220	41
Turner & Newall	·890	119
I.C.I.	1·229	937
United Steel	·828	75
Tube Investments	1·014	114
Murex	·842	6
Swan Hunter	·867	12
Guest Keen	·974	187
Vickers	1·159	67
Herbert (A)	1·027	39
B.M.C.	1·053	154
Leyland	·995	83
G.E.C.	2·289	75
E.M.I.	·937	46
Hawker Siddeley	1·549	64
Rolls Royce	1·005	31
Lancs. Cotton	·946	18
Coats Paton	1·103	139
Courtaulds	1·742	289
Bowater	·977	87
Dunlop	1·105	97
Distillers	·922	413
Watney	·928	77
Woolworths	1·249	581
House of Fraser	·900	70
Imperial Tobacco	1·346	206
Spillers	1·319	71
Tate & Lyle	1·151	60
P. & O.	2·277	60
TOTAL	35·070	£4,356

Arithmetic unweighted mean	35·070 ÷ 30 = 1·169
Arithmetic weighted mean	1·2038
Geometric unweighted mean	1·1246

Calculated index on 6.11.63 = Index on 11.4.62 (305·3) × 1·1246 = 343·3
Index as published 6.11.63 = 343·8

SYNOPSIS

Now that the original Actuaries Investment Index has been replaced by the F.T.-Actuaries 500 Share series, the Authors felt it appropriate to prepare a sequel to their earlier paper " Investment Policy and Index Numbers " submitted in 1956.

The first part of the paper deals with the selection of the constituents and of the groups for the Equity indexes, and with the methods of averaging and weighting that are used.

The new index with its wide coverage and its daily quotation represents a considerable advance over the earlier Actuaries and F.T. series and should be widely used for checking portfolio performance and for determining investment policy. Representing as it does the experience of a large and comprehensive sample of U.K. industry the index display should be of considerable application for long-term historical studies and for purposes of social research and national economic planning.

Suggestions are made for extending the index coverage so as to include items such as the asset value, the cash flow, the stock level and the capital expenditure as used for investment analysis.

In the final section entitled " Investment Analysis by Computor " the Authors draw attention to the value of the index statistics for investment analysis. These statistics might be used to build up data from which a form of investment analysis by computor could be developed.

Altogether the question of further development of the index coverage and of making proper use of the statistics is a most fruitful field for further research by members of the profession.

DISCUSSION

The President, (Mr. A. T. Haynes.)—It gives me great pleasure on this, the last occasion on which I shall take the Chair, as President, at a Sessional Meeting of the Faculty, to welcome Mr. Kenneth Usherwood, the President of the Institute—our sister body—to our Meeting. This is wholly appropriate as no meeting of our Faculty could more admirably represent the happy co-operation which always exists between our two professional bodies. As Mr. Haycocks and Mr. Plymen, the authors of the paper before us this evening, have said in their paper, the minds lying behind the beginnings of the Actuaries' Investment Index were those of Charles M. Douglas and Alistair C. Murray, two very distinguished members of our Faculty. Since those early days, the Joint Investment Research Committee of the Faculty and the Institute have endeavoured, in complete harmony, to improve the statistical background to investment not only in the life office field but in a much broader context. Mr. Haycocks and Mr. Plymen provided us with a most instructive paper in 1956 on " Investment Policy and Index Numbers " : since then, as they say in the paper that they are submitting to us today, conditions have changed in many respects, none more so than the ease with which we can now deal with really large-scale calculations with the aid of a computer. There has been, in these few years, a complete revolution in the approach to scientific problems involving a mass of data. Today one no longer thinks of small samples : the difficulty now, as our authors indicate, is to find the brains to pass judgement upon all the facts that mechanics and electronics can place before us.

In extending a very warm welcome to Mr. Haycocks and Mr. Plymen, may I say how much I hope that their example will encourage other authors of papers to the Faculty to work on an eight-year cycle. We are, indeed, delighted to welcome them back again. In their paper they raise several open questions on which they invite discussion and debate. The basis of the F.T.-Actuaries Index and its practical application are both in the development stage and we welcome proposals for future improvement of what has, I think, been a most successful joint venture between the *Financial Times* and the actuarial profession.

We have at this meeting a considerable number of guests from the actuarial and financial worlds : to them all I would extend a very warm welcome and I hope that they will feel entirely free to contribute to the discussion if they wish. And now I ask Mr. Haycocks to introduce the paper to the Faculty.

Mr. H. W. Haycocks, introducing the paper, said :—Mr. President, Gentlemen : Thank you very much for your kind introductory remarks. Plymen and I, of course, are very pleased indeed to be here once again opening a discussion on the Index.

If you do not mind, I would just like to sound a more personal note as it gives me particular pleasure that this occasion has fallen during the tenure of your present President. When I started life as an actuarial student, he was one of the first students I came into contact with and, of course, in those days there were no electronic computers and for a few years we, so to speak, learned arithmetic together. He was a remarkable student and we felt then that he was destined for the highest actuarial honours which he is holding today.

I have, of course, already heard remarks and discussed them with colleagues of mine on the context of this paper and, in fact, I heard lots of remarks about index numbers before we ever wrote the paper, and I fear that some of you will think that Plymen and I are perhaps, shall we say, just a little obsessed with the value of index numbers : but, as the President has already reminded you, the venture did originate here in Edinburgh and in our previous paper we gave a brief account of the work of Douglas and Murray, and I think it is worth remembering that they did not suggest that one needed a comprehensive set of index numbers just for, so to speak, background information but they thought it would be a more direct help to investment policy and investment timing. I am aware that there are investment managers who dislike being overwhelmed by masses of statistics and I sympathise with them if this information is superficial and unclassified. On the other hand, there are those who believe that investment analysis by means of fairly sophisticated statistical methods can be useful and should be developed. In fact, the time is fast approaching—perhaps I should say it has arrived—when these methods could be tested. There is no reason why investment analysts should not test, in the light of past experience, the suggestions and advice they give on the basis of techniques but I have seen very little published work of this kind. This is a field in which a good deal of research could be done if one could get the information. Our position tends towards those who wish to develop new statistical techniques, although as we say in our paper we are ready to look at the best of any kind of method. However, the new F.T.-Actuaries Index is a fact and, in the first place, it is right and proper that a record of what has been done should be considered and the results recorded in the Transactions. I think it is a significant event in the history of our profession that the index should be published daily in the *Financial Times*, perhaps the most well-known financial paper in the world today. This was brought home to me very forcibly at a recent meeting of the International Congress of Investment Analysts where all the delegates I met from overseas regard the *Financial Times* as essential reading. And, further, those associated with me on the Commission on Index Numbers felt that the principles that we used in the construction of the new index were the best considering the various purposes for which the index would be used. In the paper, however, we have gone farther than a description of the principles underlying the construction of the index. We point out that as the calculations are being done by an electronic computer there is no need to limit the display to price, dividend, and earnings indices. No doubt, it is here that most of you will join issue with us and, I hope, among yourselves.

There is one important matter which we have not put in our paper. The *Financial Times* and the National Cash Register are responsible for the day-to-day work and for the calculations. However, the Joint Committee felt that they should keep a watch on these calculations. I do not think this is any reflection on the very highly accurate work that the *Financial Times* and the National Cash Register have been doing but I think all of you will have heard funny stories going around about the embarrassing situations in which people find themselves when electronic computers go wrong. Mr. Sirkett has derived a quite ingenious method for checking the index and the adjusted base from time to time. I do not intend to go into any details here but I thought that you would like to know that this work is being done.

Well, Mr. President, I do not want to say any more about it : we have

said enough in the paper and possibly we shall want to say something or write something later.

Mr. J. B. Marshall, opening the discussion, said :—Once more we are in the debt of these two authors for having produced under a deceptively simple title an informative and thought-provoking paper which covers the whole range of investment. They split their subjects into the three sections named in the title and I propose to follow this lead.

On the choice of constituents and industrial groups, I have almost nothing but praise for a very difficult task well done. I say " almost nothing " for there must be some doubt about the wisdom of including investment trusts in the financial group. Apart from the question of double counting, these stocks are influenced by factors such as the dollar premium and the level of the U.S. market which have nothing to do with the British market and they should not, therefore, in my view, be allowed to influence an index of British stocks. An index of investment trusts is to some extent an index to world markets and should be included somewhere. I would not like to see them down amongst the rubbers and teas but perhaps they should be where they belong—in a class by themselves.

The provision of dividends and earnings yields is one of the valuable services rendered by the index. The paper and the published guide are a little coy about the details of calculation of these earnings. For instance, I would like to know how investment allowances are treated. How are these awful pests, convertible debentures, dealt with ? What happens when a trade investment becomes a subsidiary and *vice versa* ? And what is the effect of rights issues ?

The method of changing weights adopted for the calculation of the index is probably as good as can be devised given the present state of thinking on this whole question of charting the history of investment. But I am worried about the effects of these adjustments on the continuity of dividends and earnings. The information on this is sketchy. The guide tells us that in calculating earnings no allowance is made for earnings on new money raised by new issues. There must surely be discontinuity here. Further, dividends are said to be adjusted for capital issues but we are not told how. I have a nasty suspicion that adjustments for rights issues are made by the popular but unsatisfactory method of comparing the cum-rights and ex-rights price, a method which has, unfortunately, been adopted by at least one of the statistical services but which should be unacceptable on two grounds : first, movements in price can have no relevance to the previous history of a company : and, second, the method exaggerates unnecessarily the performance of stocks which are highly rated by the market.

The section on the index in practice starts with the discussion of the cycle in which I was glad to see the authors' suggestion that the forces which had operated apparently to obliterate the cycle might now be almost spent. When profitability and retained earnings are both high, as they were ten years ago, then profits will rise even on the down-stroke of the cycle. Now that both these are very much smaller we can expect more pronounced downward swings in profits to occur. Having agreed with the authors on this question, I am not so sure about the relevance to it of the index. I hope they will not mind if I accuse them of being a little old-fashioned in this whole section. Before the war, the index was the only source of inspiration to investors in their attempts to guess at the current state of business. Now, surely, we have more powerful weapons. First,

we have the gross trading profits of companies per quarter published with seasonal corrections fairly soon in the *Monthly Digest*: then the *Board of Trade Journal* keeps going a record of the profitability of industry from which, however imperfect the figures, the cyclical pattern clearly emerges. It was soon evident that the cycle turned upwards in the second quarter of 1962, too late to save that year but enough to ensure improvement in 1963, the results of which we are now seeing. It is possible also from the two sets of figures to make a reasonable guess that the peak of the cycle will occur in the second or third quarter of this year making 1964 a very good year indeed and 1965 not much behind it. These predictions may be quite wrong, of course. My point is that we can make our wrong predictions at a much earlier date and on much firmer grounds than by using the index. When we come to the practical application of such predictions we are on slippery ground. If the common man acts on them he will be accused of vulgar speculation. Insurance companies, of course, never speculate, but they do attach great importance to the question of timing.

The idea of keeping the graphs suggested will no doubt be generally acceptable. I myself prefer to chart the price relative for individual stocks rather than for groups. Yield relatives are not so valuable in my view. Each stock is comparable to the index for only one fleeting moment in each year. It starts well ahead in the cycle and finishes well behind. Again, it is easy to assign normal earnings to a stock but not so easy to assign them, at the moment anyway, to the index. For this reason, therefore, the proper standard against which to measure stocks remains the yield on 2½% Treasury. Through all this, I hope it is unnecessary to stress that we cannot make decisions from these graphs; they can only tell us when and where to look.

Of the other uses suggested, I would venture to say that the measurement of portfolio performance and the making of approximate valuations are the two most valuable functions which the index can be made to perform.

The section on preference share indices is the only part of the paper that rouses me to strong protest. Action based entirely upon what other people are supposed to be going to do seems to me to be the most inexcusable form of speculation. We are to buy preference shares at 125 not because we think they are good value at that level but because, on the basis of a sample of 2 (or it might be 6 or 7 but it will not be enough) we expect other people to pay more for them next month. Are they good value at 125? They yield more than Gilts because of expenses, inflexibility, and risk. If, for example, Gilts yield 4% and preference shares yield 5%, the ratio is 125. Expenses and inflexibility must surely require at least 10/-%, leaving, with no allowance for profit, 10/-% for risk. The risk premium falls as the rate of interest rises, a point which casts doubt upon the relevance of a ratio anyway. Accumulate 10/- at 4% and you can breathe again after 56 years. These figures are enough to suggest that a strong case can be made for saying that preference shares are always over-valued relative to Gilts. This over-valuation will persist so long as people base their actions on this graph, until one day, perhaps, when enough investment managers are on holiday the ratio will go through to 130 and no one will know what to do until some fortuitous circumstances establish a new peak for the the guidance and solace of future generations.

The authors can certainly not be accused of being old-fashioned in the section dealing with the future. They start by suggesting some new

factors which might be incorporated. The most valuable of these should prove to be the net assets per share, although it would be interesting to know how the difficult question of revaluation is going to be tackled. The other suggestions might also prove useful: to them, I would add a plea for the pre-tax profits and the fixed assets, both gross and net, per share.

I doubt whether there are many rigid adherents to the two schools of thought on investment analysis which the paper mentions. Of course, market research and the study of economic trends are important. Visits to plant are of some value and, in some cases, we might even concede that the views of the Chairman are relevant, although a lot of this information is more important to the speculator or timer than to the long-term investor. But surely past record is vitally important too. If you do not start from the past record, where do you start, unless you know an awful lot about the assets and management of the company concerned? Now, what do you do with the past record? To my mind, a study of the profit record alone can be misleading. Some companies grow rapidly because of a conservative dividend policy; others—some breweries fall into this category—because they were doing so badly before. This was the philosophy that Little questioned in the paper the authors mention. I prefer the approach of Hemsted who traces the history of the ratio of earnings to assets. I do not agree with the school of thought which uses this ratio as an index of management ability since it might equally well be a measure of the conservatism of the balance sheet. The trend of the ratio can, however, be very helpful in making projections more solidly based than those using earnings alone. A recent American investigation found a very high correlation between successive annual rates of return, a correlation which vanished however, after six years. For this reason, if for no other, it is not possible to accept that part of Hemsted's method which assumed that his rate of growth was going on for ever.

I do not share the authors' enthusiasm for the American system outlined. I cannot resist pointing out that if σ is high enough R can be negative, in which case you buy the stock only when the company makes a loss and the bigger the loss the more you pay for it. More seriously, the system simply defines the weights the market is giving to various factors at a given time. Now, is it not our job to assign these weights?

All the methods of valuation mentioned in the paper seem to me to fall down on the ground that they use the most probable estimate of future growth without examining the distribution of all possible future estimates. Something along these lines is, however, necessary to convert a vision of the future into £ s. d. There is no doubt that the scientific side of investment is being developed. A lot of actuaries seem to be shy about this which is a pity since it is most desirable that actuaries, with their background of statistics and compound interest, should play a prominent part in guiding these developments along the right lines.

Mr. J. R. Gibb,—Like our Opener, I found this "Shorter Textbook", as I would call it rather than a paper, a most excellent one and, once I got over the length of it, enjoyed reading it very much. I think it will prove to be a standard reference on the whole subject of index numbers. I would like to begin with one or two carps. The absence of a gold index seemed to me unfortunate, especially since the variable weights method accommodates itself very well to old mines dying and new ones being started. Perhaps the authors expect to make so much money that they do not need a gold index.

I agree very much with the authors on the subject of fixed interest indices. They seem to be of very little use indeed and I know that during the short time I have been on investment work, under the old series I never once looked at any of them at all, the reason being that the only one that is of much interest—the preference index—we, ourselves, kept on a daily basis. It seems to me that the redeemable debenture one is of no interest to anyone at all owing to almost complete inability to deal. The Government indices are not much better because of the degree of sensitivity in gilt-edged is so great that trying to collapse the market into one index achieves nothing. One wants a lot more detail and once one gets into questions of detail, one finds that it is already provided by at least two lots of brokers in various very good ways. I do not see the task of the Joint Committee to be like an investment octopus spreading tentacles here, there, and everywhere. It is rather a matter of filling the gaps and I do not think there is a gap here.

On page 383 the algebra, I thought, was slightly misleading. I would have found it easier if p^t for any time after s (which is the date of the change) were $p'i$; admittedly the two are usually the same, but I think it would be a little clearer.

The question of the bias that may be introduced by the elimination of small companies is mentioned in the paper. It might possibly be a material feature. There is no danger so long as one is aware of it, but it is well-known that it can be just as important to have your money in companies of the right size than the right anything else and the authors, in fact, admit this when they are dealing with the old F.T. index on page 399, where they say that the thirty constituents largely represent the industrial giants and may have suffered from elephantiasis. They mention the question of judging the performance of a high yield and a low yield portfolio. Well, I should have thought that the answer to this was fairly easy. A high yield portfolio yields better and grows better, but if this is not accepted either *a priori* or from such investigations as have been made, it would seem to be necessary to construct an index where the price relatives were increased by $(1+i_i)^t$. In other words, you are assuming that dividends are paid instantaneously and are re-invested in the company. You would then compare this with your own performance—the capital plus the income received reinvested on, well, a simple basis—quarterly if you could have the figures. Whether any great value is to be found from this is, I think, a matter of opinion because the actual portfolio will be changing all the time from high yielding to low yielding according as you think the one or the other is more attractive. In dealing with such an index, the question of tax would be important because you obviously could not produce an accumulative index which was correct for all tax positions, but I think that if it were done gross it would be useful because you would have the gross which would be correct for those who were gross and the element of interest accumulated could easily be obtained from the straightforward index so that if people were on a banker's basis, which some life offices, in effect, are, where they are taxed about equally on income and capital, then an adjustment could easily be made for that.

I agree very much with what Mr. Marshall said about the fact that index figures are dead and come alive only when someone thinks about them. It seems to me that, on page 393, the authors were in retrospect blessed with a providential degree of foresight. I could not for the life of me see how anyone could say that the upturn which occurred in September 1962—and I

am sure Mr. Marshall would have got it much earlier from his Board of Trade figures—was established until March or April 1963. I think it is also true that cycles, like beauty, seem to be in the eye of the beholder. On page 394 the authors say that the following table demonstrates the cyclical nature of the capital goods trades, but I was impressed by the consistent decline in the price relative from 1955 throughout the table and the cycle, such as it may be, is a very tiny little wave during that consistent decline. On the figures, the consumption goods trades exhibit a rather stronger cycle than the capital goods. I think the important thing is that no automatic triggers are fired by any index and that their value comes by drawing attention to where one should look and by the fact that a reasonable notion of what is the norm and how far it is possible for a departure from the norm to go, is necessary to throw light on to all these index figures so that useful conclusions for action may be drawn, and I think this is shown up to some extent in perhaps the most interesting section in the paper, that on Developments. Here, I am very much at one with Mr. Marshall and with the authors in trying to restore to a proper importance the question of assets. People seem to have forgotten about assets since the war and there has been a great tendency to concentrate entirely on earnings. Now, this was partly due to inflation and I think that the move back to considering assets and the yield that may be obtained from these assets is very timely—in fact, it is overdue.

In the regression analysis that is suggested by the authors, I would put the point that Mr. Marshall made in a slightly different way : the method finds out the weights in the market so that you may consider whether some of these weights are quite wrong and what standard you would set up yourself. It is a method of singling out what are examples of, by your standards, a high or a low share ; this has its use but I would appeal for the results of these investigations to be shown not necessarily exactly as they were obtained. It seems to me that it may not be the best thing for analytical entrails to be dragged across the paper, the reason being that unless you have the entire exposed to risk from which these particular phenomena were extracted, then the fact that they have been selected on this basis is not clear to you. If you are merely presented with particularly extreme cases, you want to examine them by a more general method and, for example, the reason why a share may be cheap may be that the return on the capital is showing a particularly favourable tendency. It may have been falling for a while and has shown a definite tendency to be reversed. However, attention must be directed to this factor and not to the fact that it was thrown out by the regression analysis, and, if I may make one small point on terminology, the authors were, I thought, very good in not using " cheap " and " dear " which are very important words because they ought to convey the necessity for action and they are very careful most of the time to say " high " and " low " which are matters of fact. They did, just very slightly, fall into the possibility, doing this regression analysis, of suggesting that it would produce shares that were cheap or dear. A share is only cheap or dear when, having weighed the facts thrown up by these indices, by the application to them of some previously established standard which you believe can be maintained in the future, you consider the price to be lower or higher than is justified by the possibilities thrown up by that standard.

Mr. A G. Ellinger.—I must apologise for being the first visitor to address

you but I am very much pained by one thing put forward by the last speaker and also put forward by the authors and that is the idea of abolishing fixed interest indices. I only want to use their reciprocals : I do not care about their yields at all, but I produced a long time ago a thing which I called a " confidence indicator " and I want to be able to go on producing it. The confidence indicator which I produced was the reciprocal of the product of the *Financial Times* fixed interest stocks index and the *Financial Times* ordinary yield. It is still being worked out on that basis. The Editor of the *Financial Times* proposed, when he introduced and started printing the new indices, to stop printing these things altogether. There was a fairly good howl of protest from myself and other people and he shelved the proposal for six months. Perhaps he has forgotten about it but he has not abolished them yet, anyway. Clearly the confidence indicator would be very much improved when it is based on the 500 share index or 594 share index with 500 or 594 changes of dividend a year instead of having only thirty changes of dividend. But I am very doubtful if it will be satisfactory to substitute Treasury 2½% for the old fixed interest stocks index. I suspect that this moves too much, too quickly, while the fixed interest stocks index is a very imperfect concept but reflects fairly well a great deal of imperfection in the market. The rate of interest that one sees in the market is something which moves very stickily—one of the elements, for example, is the rate of interest offered on building society share investments and deposits. These hardly move at all except that sometimes the " Halifax " has the idea that they ought to move theirs against everybody else's wishes.

Now, we have been experimenting with fixed interest indices for this particular purpose and we think that the mix we are going to want is roughly half the new Government securities index which is in the F.T.-Actuaries series and half the debenture one and this, we think, would be a fairly reasonably sticky index which would serve our purpose very nicely. We are doubtful if Treasury 2½% really would serve as well and, speaking from memory, I think the specimen of confidence in Figure 3, which appears to be worked out on the Treasury 2½%, does not show as much divergence against the share index in June and November 1962 as the one which we worked out using the F.T. fixed interest stocks index and, if there are going to be divergences, the bigger and clearer they are when they appear, the better : and, therefore, I hope that too much stress will not be placed on the desirability of eliminating these two indices although, apparently, nobody except myself wants to have them.

Mr. R. I. M. Macaulay.—I would like to congratulate the authors on a very timely and stimulating paper which I am sure is going to give us food for thought for quite a long time to come.

I want to restrict my remarks to the narrow field of portfolio performance which is, in fact, referred to in paragraph 47 of the paper. There has been a growing interest in this field, in the pension fund world particularly, and particularly amongst the Treasurers of Local Authorities who are now investing in ordinary shares, and I was recently asked by the Treasurers of two Local Authorities to help them on this subject. Any scheme to be used by non-specialists must, of course, be simple to understand and also simple to use—and I stress this point as one must be able without undue labour to test, if necessary, against different bases and also to test sections of the fund separately—but it must also, beside being simple, be reasonably

accurate. The more I tried to reconcile accuracy with simplicity the nearer I got to the method described by Gilliland and mentioned in the paper. I felt, however, that some alterations to the method were justified and I will come to these shortly, but the method arrived at after some useful suggestions by Mr. J. M. Brew has now been adopted by a group of eleven, mainly large, Local Authorities for whom comparative figures were produced by the Authority which initiated it. It might be of interest to state here that the system of management of Local Authority superannuation funds is by means of a panel, generally of outside investment advisers, with two or three firms of stockbrokers. I am not aware of the type of management that was, in fact, used by each participant in this exercise or of the composition of the panels but this might be a fruitful field for future examination in view of the wide divergency in results. The normal type of panel member is an investment specialist from a merchant bank, insurance company, joint stock bank trustee department, large industrial pension fund, investment trust, consulting actuaries, stockbrokers, etc.—with about two or three people on the panel.

Very briefly, the performance was examined for the two periods of one year to 31st March 1963 and six months to 30th September 1963 and the following points arose from the examination of the figures. In the first period the performance against the F.T.-Actuaries All-share index varied from plus 4·9% to minus 11·3% and in the second shorter period only between plus 1·9% and minus 1·9%. The funds which did well in the first period did less well in the second period ; those funds which did badly in the first period did less badly in the second period and, finally, the size of the fund appeared to have had no significant effect on the results even though the funds varied from under £200,000 to nearly £2½ million. Unfortunately, I do not have access to the data used in the comparison, the whole question being treated as one of confidence. This is perhaps not surprising as managers of other institutional portfolios would no doubt agree ; the introduction of a publicly competitive element into investment management is fraught with obvious dangers, interesting though the results would no doubt be, although I noticed that one leading Trust was brave enough recently to give comparative figures which showed that its performance had not been as good as that of the index over a recent twelve month period.

A brief résume of the method might be of interest. Gilliland's basic idea was adopted, that is, the comparison, in this case against the F.T.-Actuaries index, of the market value of a portfolio at the beginning of a period with that of the equivalent portfolio at the end of the period. This equivalent portfolio is found by adjusting the market value at the end of the period for the effective new investment during the period. The net amount of money invested in any one month is simply cost of purchases less proceeds of sales. These monthly sums are then " invested " in the index using the average of the daily index figures for the month and allowing for the approximate cost of purchase. Any very large sums invested over a short period can be treated specially. The index value of these purchases as at the end of the period is then deducted from the actual market value of the portfolio at the end of the period to give the equivalent market value. The ratio of this to the market value at the beginning of the period can then be compared directly with a similar ratio for the All-share index. This is not, however, the whole story. Over a period the return on a fund can be a significant factor in its build up and quite substantial variations can occur,

Amongst the Local Authority Funds already quoted the yield on the equity portfolio on 1st April 1962 varied from 5·19% to 3·35% and, in passing, I might mention that the three best performers of the eleven were the two highest yielding and the one lowest yielding. If one looks at income and capital growth as both contributing to the accumulation of a fund, it is easy to see that one only has to add the yield per cent. per annum on a portfolio to the percentage growth over the year to get the accumulation percentage, and the same applies to the index. Adding 100 to both and dividing the portfolio accumulation figure by that for the index you get a combined capital and yield performance factor.

That is the method very briefly; I know, of course, that it could be improved by a number of refinements but only at the cost of simplicity. Two areas where improvements obviously could be made are: (1) *the incidence of new money.* Inaccuracies can be very significant where the new money is a large proportion of the total assets as in a new fund and particularly when the index is swinging fairly rapidly and it is probably fair to say that in the very early years of a fund's life the method described could give slightly misleading results. (2) *Effect of changes in investment.* By investing new money in the index one is taking credit or otherwise for selection, timing, etc., in respect of new purchases. Where these arise from the proceeds of other sales it might be equally pertinent to enquire what has happened to the sales from the date of sale to the end of the year.

There is no need, in my view, to calculate the performance more often than once a year. In general I would not come to any conclusions on the performance of a portfolio over a period of less than three years altogether and to make the calculation more often than once a year seems to be unnecessary. I have not discussed at all the question of a gilt-edged portfolio; this would take too long. One of the problems that arises if you are going to measure a gilt-edged performance, is the sort of index you are going to use, and if you have a mixed portfolio of fixed-interest and equities, what standard you are going to measure against. I think the most important thing in devising a system of measuring portfolio performances is to decide exactly what one is attempting to measure; the rest of the work is comparatively simple.

Before I end, I would like to make a plea that pressure should be brought to bear on the *Financial Times* to employ the F.T.-Actuaries system of classification on the " back page ". Approaches have already been made on these lines, and I do realise the difficulties of a change of classification of this type but the more people come to use the new index and the more that the users clamour for this change the greater will be the chances of having a standard system of classification.

Mr. J. D. Campbell—The quality that most noticeably occurred to me about Mr. Haycock's and Mr. Plymen's paper is its comprehensiveness. A large number of the problems facing the investment manager are alluded to in the context of their discussion of the F.T.-Actuaries Index and this makes the paper very stimulating.

Does past experience, expressed in statistics or otherwise, convey the events of the future to the investment manager ? I read the other day that we are living in a scientific age where management of industry needs to be based on precise measurement rather than elegant hunch and on the organised use of the latest technical methods. This may be so but I believe that in investment management only broad generalisation can be projected. For example, if a company or industry is in a depressed condition

we may assume that an attempt will be made to revive its fortunes. I feel that a criticism can be made of many statistical investment forecasts in that they are too marginal. For example, if a share is too dear on a 6% earnings yield basis, I doubt if it is reasonable to think it is attractive on a 7% basis. Conclusions based on narrow margins may be the outcome of closer and closer statistical analysis—an over-zealous attempt to erect conclusions on very fine differences. Even if we make what prove to be close forecasts of such matters as the supply and demand of a company's or industry's products, we still have to try to put the right price on the value of future earnings and dividends. Over-precision seems out of place due to the multiplicity of impinging factors. Faith has a large part to play in investing and the faith we follow is that because industry has proved a profitable investment in the past, it will continue on the average to do so in the future and, of course, if you are a long-term investor you can keep pushing out the term on these shares that are a bit sticky !

A nice test of whether one can extrapolate from the past would be found in the table in paragraph 36. This is a graphic exhibition by indices of how one could have made money by switching between capital goods and consumer goods, jobbing backwards. The test is, of course, to insert in the table now the figures that will persist in one year's time.

The authors discuss the measurement of portfolio performance by comparing the performance with the movements of the new indices which are undoubtedly well-designed for this purpose by their large coverage. Just how this should be done, however, merits some consideration. For example, in a fund whose purpose is to invest for income, it may not be of much significance to know whether over, say, a twelve-month period the capital movement of the fund is better or worse than that of the index. In the long run, of course, money is money whether we call it capital or income, but there is the difference that income does get into the bank whereas tied-up capital profit only does so if it is realised.

In paragraph 46 the possibility is aired of measuring the advice of investment tipsters and investment counsellors over a period by comparison with the index. I dare say that the Consumer Research publication " Which? " would be interested in such findings. In a way, I think this idea of measuring performance of past investment advice so intimately is an indication of the limitless attractions which share and stock exchange statistics can produce.

The authors discuss many interesting factors and tools for use in formulating investment policy. What the investment manager is trying to do, as has already been mentioned tonight, is to buy a share or a security when it is cheap and to sell it when it is too dear. As described by the authors, one useful tool is the dividend yield ratio, that is, the relation of the yield on a particular share not only to the index yield as a whole but to the share's own past yield and also to the yield on gilt-edged. This method at any rate throws out the relative apparent cheapness or dearness of a share. Another useful aid is the ratio of profit or earnings to capital employed. Taking several years together—and here I agree with Mr. Marshall—this ratio does help to define the nature of a company, that is, it shows up the past stability or otherwise of a company's profitability.

The evolving techniques of investment analysis seem to open the way to an increasing degree of activity in the buying, selling, and switching of investments which is perhaps one reason why more and more analysts are being employed in stockbrokers' offices ! In so far as investment means

the placing of capital to purchase income, one wonders if the expression " investment analysis " is altogether the right one for the sophisticated approach now sometimes used to recommend buying shares with little or no yield or to switch from one share to another on varying arguments. I wonder if a more apt phrase in some ways than " investment analyst " would perhaps be " speculation specialist " !

In terms of investment management, I found that paragraphs 79, 80, 81 and 82 contain much of interest. Paragraph 79 describes the need to look back and think forward about any investment which, perhaps rather obviously as Mr. Marshall has already said, is certainly necessary. Paragraph 81 is fascinating and I would like to know what trades are governed by reliable trends which can be forecast ahead with confidence. I would accept the answer tonight but a private letter would be just as helpful; also, of course, I would wish to know the right price to pay for the future benefits.

From the point of view of the management of an investment portfolio, there are two points I would finally like to mention. The first is that no matter how clever or advanced the index or the statistical tools developed for investment selection may be, the most important principle for the investment manager to continue to follow will be to spread his risk. The second point is that once the statistical work is done, the investment (profitable, we hope) is still to be made and at this stage, a considerable degree of resolution and persistence is often required, leading perhaps to immediate action but sometimes to action at a later and more opportune time.

Mr. A. T. Jamieson.—In the first place, may I congratulate the authors on the wide ranging nature of the paper they have written and on the great deal of scope they have given us in this discussion tonight. There is one subject, however, which is conspicuous by its absence; this is the question of the degree to which we are entitled to infer facts from a given set of statistics. I realise that statistical tests related to time series are of some complexity and are relatively intractable to handling, even by computer. I would, however, draw attention to the table the authors gave in which they show that at the 1st August 1963 the *Times* Index showed a 4½% rise over the base date whereas the F.T.-Actuaries 500-Share Index was showing a 5·4% rise. This difference is sufficiently great to make one wonder whether, in fact, there has been a significant difference in some way between the two indices. This is of particular importance if, as Mr. Macaulay has already suggested, we are to use one of these index numbers as a fairly critical test of portfolio performance. I have tried to do a little research into this subject myself but I find that the only test that could be applied requires a fairly long time series—longer than in fact we have available at the moment for the F.T.-Actuaries Index. I would, however, like to hear if the authors have any thoughts on this subject.

Another subject which I would raise with the authors is the question (already mentioned by Mr. Marshall) of the relationship between company performance and economic data. The authors make a brief reference to this in section 39 of the paper but this does not involve the use of index numbers. Further, in section 81 the authors make some references to reliable trends, all of which, I would suggest, are very vulnerable to external economic change. Unless one is prepared to relate a forecast of company performance to the economic data at one's disposal, one is taking a risk of

uncertain dimensions. This brings us back to the statistical side—there are no tests to measure the likely degree of error. (I am speaking here in a very broad sense of the word, not in the precise statistical one). I would emphasise, therefore, the need to estimate the likelihood of error in relating any of the share index statistics to the statistics of the economy. There is one small matter on which I disagree directly with the authors: this is the question of the ratio of the value of the assets to the price. If one had a precise and correct value of the assets—assuming such a thing exists—I am sure this would be of interest, but the figures we are given at the moment on a company balance sheet involve valuation of assets, usually taken at different times, and bear continuously changing relationships to current values. To give an example, one may have a company which has valued its assets, say in 1956, and has been adding thereto constantly since then. In this case, some of the assets are in a 1956/1964 relationship to current values whereas others will be in a 1963/1964 relationship. I do not see that a ratio between such a value of assets and a current price which is based on expected incomes in the future can be of great use; I would therefore like to record my disagreement with the authors on this aspect.

I would, however, like to suggest instead that what would be of great value would be some relationship between company statistics and the economic statistics relating to the relevant industry. Alternatively, group statistics could be related to their industry's data. Something could thus be discovered on the application of the "leads and lags" to company performance forecasts. In other words, if we can find the statistics of the economy which most clearly influence the performance of the company, we shall be taken a long way towards deciding which companies will do best in the future. We can then take the second step of estimating whether the price that we are being asked to pay by the market relates sufficiently closely to the expectations of the company's performance.

Mr. J. D. Binns.—I would like to start by supporting Mr. Gibb who suggested that the debenture index might possibly be scrapped; taking all the debentures outstanding on the London Stock Exchange, the market capitalisation is only of the order of about 1/20th of the market capitalisation of all the ordinary shares. In other words, it is not a terribly important segment, particularly when you couple that with the fact that half of these debentures are held by insurance offices, let alone what may be held by other institutional investors. I also felt about the preference index that the suggestions made in the paper were perhaps making rather a lot of a still less significant section, in that there is considerably less preference in existence that debentures. This would leave Mr. Ellinger looking for something else to base his confidence index on, but I would suggest to him that he should perhaps educate the general public to come away from his somewhat amorphous confidence index, and base it instead on $2\frac{1}{2}\%$ Treasury. An institutional investor with money coming in all the time has three choices before him and, if you go to the logical conclusion along each line of choice, he can either hold his money in cash, or he can put it into fixed-interest stocks and the logical conclusion there is to go as long as he possibly can, i.e. into $2\frac{1}{2}\%$ Treasury, or he goes into ordinary shares, and on this argument the balancing factor which relates the market values of ordinary shares to that of everything else should be their relationship to $2\frac{1}{2}\%$ Treasury.

I would like to confine my remarks on the paper entirely to Part 1—the designing of the index. For the index to be of value, there are five criteria that it should match up to. It should be soundly constructed. We know that the " Dow Jones " Index, for example, is very far from being soundly constructed. Thirty individual prices are added up, divided by a base line, and that is the " Dow Jones " Index. If one stock is priced at 100 and another stock is priced at 10, the first one has ten times the weight of the other one. We have not fallen into that trap as actuaries. Secondly, the production should, for real value, be both daily and punctual. I am credibly informed that an index of Paris prices is produced punctually but calculated on the prices ruling at the beginning of a day, so that by the time it is in anybody's hands it is already out of date. Thirdly, the index should be adequately sub-divided and the actuaries' index is, in fact, more extensively sub-divided than other indices. Fourthly, its coverage should be comprehensive, and here, I think, the authors do a little less than justice to the new index when they say on page 380 that the total equity capitalisation incorporated in the index amounts to 60% approximately of the value of all quoted equities in the sections concerned. The London Stock Exchange produces two sets of statistics. One is headed, " Statistics relating to Securities quoted on the London Stock Exchange ", and the other, " Interest and Dividends upon Securities quoted on the London Stock Exchange ", and the latter has what would seem to me to be a more apt figure to compare the index with as it gives the total market value of equity securities with a sterling denomination, registered and managed in the United Kingdom. Since the Actuaries' Index is setting out to give an index of sterling securities registered and managed in the United Kingdom, this would appear to be the appropriate denominator and, taking that rather than the more broadly based figure available from the other source, I find that the F.T.-Actuaries Index is covering 75% of the total and not 60%.

Fifthly, the method of keeping the index up to date should be a satisfactory one. I feel that the *Times* Index is less satisfactory than the *Financial Times* Index in that it starts from a base date with amounts proportionate to the market values, but these are not kept continually up to date with the result that as the years go by the weighting becomes only historically accurate and not accurate at the present time. I feel that the authors at this point are less convinced than I am of the merits of the new Actuaries' Investment Index. I find on page 385 that " for some problems of investment analysis it would be more useful to have a proper average against which to compare the performance of individual shares ". I feel that is rather an unhappy expression, casting an aspersion on the Actuaries' Index. They evidently got more impressed with the merits of the index later in the paper because the table on page 416 describes the figure against which to make comparisons as " weighted mean for the group " as listed. I feel that that would have been a happier expression to have used on page 385. Again on page 383, " in the current weight index changes are made for the same reasons " as with a fixed-rate index " and also in order to keep it up to date, for example, when there are increases in capital and when it is considered that new or growing companies should be included in the constituents." It is only in this sense, the authors go on to say, that the F.T.-Actuaries Index can be called a currently weighted index. In what other sense could any other index be said to be a currently weighted index ? If, for example, tomorrow the ordinary shares of Union

International or Ferranti became quoted on the London Stock Exchange, then it would be perfectly right for Union International or Ferranti thereafter to have very considerable weight, but you could not possibly give them weight retrospectively for the simple reason that they had not been quoted before.

Mr. P. Giles.—I was very intrigued to see in the paper that one of the problems in an investment department is the plotting of the graphs to compare the performance of a particular share with an index. Naturally, this takes a fair time by hand but I would suggest that a simple method is now available in the form of the machines used for computation of the index. It should be extremely simple to write a short programme that will produce from the line printers usually available in computers a reasonably accurate graph and this will be particularly valuable where the comparison between two graphs is of interest, rather than the absolute values applying to each point in the graph. There is a certain amount of work in punching up the figures in paper tape, or cards but, if the graph is produced, so to speak, sideways, the print unit moving along the x axis, then there is only the need to produce one fresh card on every date at which a fresh price is available. The previous cards have been made up for the production of the same graph at an earlier date. This would facilitate the production of graphs in a fairly large volume with only the necessary routine preparation of a small number of punched cards, the programme being a piece of preparation which need only be done once at the beginning.

Mr. F. S. Jamieson closing the discussion, said:—I would like in the first place to thank the authors for a most excellent paper. This is the second paper we have had from them but these two papers by themselves are by no means the full measure of our debt to them. In any fairly large committee like the Joint Investment Research Committee, it is almost inevitable that the brunt of the work falls on one or two members of that committee and, in this case, for many years past the brunt of the work has fallen on Messrs. Haycocks and Plymen. Haycocks, as you will probably know, for very many years supervised the old Index, so he has a unique knowledge of the practical difficulties and snags of producing an index which came in, with his other knowledge, extremely useful in the discussions about this new index, while Plymen was responsible for revising the constituents of the ordinary share section of the old Index on both the revisions in the 1950's, and he was responsible for the ordinary share section constituents in this new index. These, as you will realise, are by far the largest part—practically the whole of it—and did involve an enormous amount of work.

Now, I would at this stage like to pay tribute to the co-operation which we have had from the *Financial Times* in connection with this new index. There has been a very happy relationship brought about with them and these two gentlemen are largely responsible for this. The profession does owe them a very great debt indeed and I am very glad to have this opportunity of acquainting you with this and of acknowledging it.

As regards the main section of the paper, you will not expect me as a member of the Joint Committee to be too critical about the section dealing with the composition and the formulae of the new index; and, as regards any criticisms which have been made—which have not been very many—I feel that the authors are really much better able than I am to answer

these. There is only one small point which I would like to refer to and that is the continued use of 2½% Consols. as the irredeemable gilt-edged stock used in the index. As the authors say in the paper, it is really a quite unsuitable stock for this purpose and when this new index was being started all the Scottish members of the Joint Committee unanimously recommended that 2½% Treasury should be substituted, but we were overruled by the London half and, as they contained the Chairman, we had to give way! I am very glad to see that two of the London Members now seem to have second thoughts on this point!

In any index like this, the final solution must be a matter for compromise and there is room for continuing arguments about such things as the type of mean employed and the different methods of weighting, if any. We feel in this index we have reached a reasonable solution and a reasonable compromise, where compromise is necessary. My guiding view during the discussions regarding this new index was that in a large index of this type differences of treatment do not affect the index nearly as much as they do in a smaller one and we could, therefore, make some concessions to practical considerations which are important in a daily index because the *Financial Times* schedule for getting all the prices into the computer and producing this index in time for publication is a pretty tight one, as the authors of the paper will confirm. We cannot, now, of course, make any major changes in the form of the index but it is still possible to improve it in minor ways. This has already been done and is a continuing process.

When I said that one could make some concessions to practical considerations, I did not mean that I was advocating any sort of slovenliness in connection with this index: I feel that any index with "Actuaries" in its name should start as the best and should remain as the best. There have been a certain number of competing indices started recently and certain eminent people connected with them would be only too ready to pick holes in our index if they could find them. I am not aware, however, that there has been any major criticism as yet, but what I am stressing is that, although this index has been started, the Joint Committee has a continuing job to do—and an important job—and I do hope that if any younger Fellows, particularly those in the investment field, are in the future asked to serve on this Committee they will be prepared to do so and to give of their best. In that connection, I may say that we did have a very encouraging offer recently from the Faculty Students' Society to give some help in any statistical researches or similar work necessary in connection with the index and the Joint Committee welcomed this spontaneous offer and will certainly make use of it.

As regards the further statistics proposed, I have probably got a nasty cynical mind, but I sometimes wonder if all this mass of statistics for investment analysis that now comes out is not more often produced from the point of prestige in the fiercely competitive world of stockbroking rather than from the added help it gives to the poor creatures who have got to make a decision as to what to buy and sell. However, that, Sir, is a rather mischievous aside and, quite seriously, there is a vast amount of information stored in connection with the index and it is certainly very desirable that some additional statistics should be produced as suggested and they will be produced.

Plymen has been the driving force in pushing for this to be done and he is probably rather disappointed at the slowness of the Joint Committee in doing anything about it, but we felt that we did not want to do too much

too quickly, that we would like to get the index properly started first and that we would like also to be sure of what the most useful additional statistics to provide were, and this discussion will have helped the Committee in that. The Scots are often accused in actuarial circles and elsewhere of being rather slow and against any innovation or novelty, but we have backed up Plymen's energy and initiative in this matter and I do not think he can accuse Scotland of dragging its feet here.

Finally, Sir, I would just like to refer to one or two future developments which are not public yet but which I think you would probably be interested to hear. I am sorry the Chairman of the Joint Committee is not here tonight but I am sure he would approve of what I am going to tell you. First, a relatively minor point about the fixed-interest indices. They are, of course, a minor part of the whole; they are not so important as the ordinary indices and they are not discussed as much, but they always have been rather Scotland's baby in that the Scottish section of the Committee has been responsible for their various revisions and was responsible for that section in the new index. I have therefore always had rather a soft spot for them, and I was rather hurt by some of the rude things that were said about them tonight. As regards the preference share index, I think it is a reasonably useful one. Admittedly, as Marshall says, preference shares may be chronically dear but that is not the fault of the index; it merely has to state what the situation is. It could, I think, be improved as is suggested in the paper and is one in which fairly radical changes could be made without discontinuity or without spoiling what has already been published. The redeemable debenture index was really the brain-child of two Scottish members of the Committee, Messrs. Binns and Sibbald—and in case I am wounding Binns' susceptibilities, I may say when I say "Scottish" in this connection, I mean "resident in Scotland"—and I was horrified to hear Binns committing infanticide by now saying it was no use at all. The redeemable Government securities index which was published for the first time in this new index—the redeemable debenture one started in the last few years of the old index—is, of course, an offspring of the redeemable debenture index. As regards the redeemable debenture index, it is maybe interesting to hear that we have had a suggestion from a very high quarter indeed—in fact, from the Deputy Governor of the Bank of England—that these fixed-interest indices are very useful indeed but that the redeemable debenture index would be much more useful if we could provide a yield as well as a price index. We only give a price index at the moment. This has been discussed by the Committee and the yield is going to be provided. So, although some people do not think much of the fixed-interest indices, some fairly distinguished people apparently find them useful.

The second thing is the importance, to which Binns quite rightly referred, of keeping this index up to date. The Joint Committee have appointed two sub-committees, one to review the constituents continuously, to consider the introduction of new groups and also to review any minor changes that may be necessary in the formulae, and the other to consider this question of the publication of further statistics which is dealt with in the paper. Binns represents Scotland on both these sub-committees and I know all my Scottish colleagues, as well as I, are very grateful to him for undertaking this work.

Finally, Sir, when the index was produced, the *Financial Times*, in consultation with us, produced a guide which has already been referred to in the discussion and it is quite interesting to know that I was told recently

by the *Financial Times* that they had been absolutely astonished by the demand for this. They had expected a very small demand for a booklet dealing with a technical and rather dry-as-dust matter like this, but they say that the demand has been far greater than they ever expected it to be. Now, of course, the index has been going nearly two years and changes do take place; constituents change and things like that. The Joint Committee did feel that it would be useful, both for the information of our members and as a historical record, if there could be an annual note published in the *Transactions* and the *Journal*, bringing the information about the index up to date. I have been in touch with the Editor of the *Transactions* about this and he has said that he would certainly be pleased to publish this. In the existing guide there is no list of the constituents; it merely deals with formulae. I would hope that in the first annual note we would be able to give a list of the original constituents and any changes from the start up to the time of the note as well as any changes in formulae or methods.

I would just like, Sir, again to thank the authors very much for a most interesting paper.

Mr. A. T. Haynes.—I think at this stage of the meeting it will be appropriate, without anticipating the vote of thanks to the authors, which will come at the close of the meeting, to express our thanks to the Committee and Mr. Jamieson and all his colleagues, not excluding in this connection the authors themselves, for all the work that they so patently have devoted throughout the years to the Actuaries' Investment Index and the creation of the new F.T.-Actuaries Index and to the study of further developments. I feel that they have performed a very great service to the profession as well as to the world of finance and to the life assurance offices and, I have no doubt, to investment trusts and many other people as well.

If I might, in my personal capacity, just make one or two comments very briefly. I do not want it to be thought that in dealing with very small points I am dealing with what Mr. Jamieson has called pin-pricks, but, at any rate, I would have obviously a great deal of support here and from Mr. Jamieson himself—in fact, I am only lending him support—in saying that 2½% Treasury, to my mind, is the only possible guide to the pure rate of interest in the gilt-edged market.

The point that worried me in watching the progress of the sectional indices closely since they were first published is how one is influenced in reading the figures by what happened to be the highest level of the particular group at the base date which is a purely arbitary date. There are one or two references in the paper to the progress of the financial group having been completely against the trend of other groups during this period since the base date. Well, it is, of course, a fact that the financial group, by and large, was at a very high level indeed at that base date and I think if one can take a base date a few years back one might get a very different impression today of the relative performance of those groups. I have often wondered, and I do not know whether the Committee or our authors have looked into this question, whether one could take as the base date—or, shall I say, as a base of the index—the average price, related to 100, over a period of years which might cover whatever one loosely thinks of as a cycle. I know that really one ought to be able to adapt one's mind to relating a table of index numbers to the base line but memories begin to dim as to the level of various groups in the market at a date in the past and it does

seem to me to be a matter of presentation which could be capable of modification.

Now, Gentlemen, I am going to ask the authors to reply. Tonight we are working very much on the basis of precedent. As I said, the same authors came here eight years ago ; I do not think I mentioned that it was also on the third Monday of the month : the same member of the team opened the discussion and they both want to—well, shall I say, Mr. Plymen intends to speak first in closing tonight, as he did eight years ago, and Mr. Haycocks wishes to have the last word.

Mr. J. Plymen, replying to the discussion, said :—First, I must thank the members of the Faculty for the sympathetic and kindly reception given to this paper. As Mr. Jamieson has mentioned, Haycocks and I have been concerned with this index problem for a long time and one of our objectives in writing this paper was to put across to members of the profession what a tremendous statistical work the production of this index is. I feel that in the ordinary way readers see the index in the paper every day and just glance at it and that is that. Years ago, when the old index got a bit out of date it was just one of the things that Miss Jones or, as I am in Scotland perhaps I should say, Miss Macdonald, used to file away on a shelf and nobody else looked at it. Well, we have tried to change that with the new index. In particular, the *Financial Times* invest a tremendous amount of effort and money in producing it. The organisation involved there in collecting every day all the prices to a very tight time-schedule is a tremendous project and we must be very grateful for the co-operation we get there and for the fact that whenever we have further ideas the *Financial Times* people always seem fully prepared to take them up and to spend money on computing and development.

As regards the specific points, Mr. Marshall commented on the question as to whether investment trusts should be included in the index. Well, here we come to the basic problem of indices. For what purposes are they to be used ? If the index is intended as a sort of model portfolio like the model offices we talk about in the context of actuarial valuations (and the index may be looked upon as a model investment office), it seems to me that on those grounds we should include in it all categories of shares that investors are likely to hold ; here I do not know really whether the investors we are thinking of are the financial institutions or the thousands of private investors. In either case investment trusts are a major feature of the financial scene. With their very substantial capital their shares appear in many portfolios and we feel that the index is entitled to include them. We must admit there is the other factor : if we are looking at the index as a pointer to the performance of the national economy, then the investment trusts, with their double counting and perhaps the oil shares with their external interests, should not be included. The fact is that we just cannot cope with the two conflicting basic requirements in one index.

The next point concerns the earnings. The *Financial Times* staff calculate the earnings most assiduously from the annual reports : they do not rely on any statistical services and they do not use preliminary figures. They wait until the actual reports come. They do, however, attempt to eliminate the investment allowances : the earnings are therefore *ex* investment allowances, that is to say, the earnings are lower than they would be if we took the net earnings for the equity as the standard. This point whether we should or should not include the investment allowances is a

matter of opinion and is something to which we are giving very careful consideration.

Mr. Marshall also mentioned the question of adjustments for rights. The index procedure does not just use the ratio of cum-rights to ex-rights prices: starting with a cum-rights price the ex-rights basis is worked out on the appropriate formula; a lengthy memorandum could, in fact, be written on the subject of the detailed procedures laid down for all the numerous different types of capital changes that may arise.

Next there is the further point about the business cycle and the use of profits figures as well as indices. Well, I am all for that. Unfortunately, however, when comparing business cycles with indices, it is the share index that usually turns before anything else and I should think that whilst the idea of using the profit figures is a very helpful one, they are likely to be rather behind the index by the time they are published.

With regard to the question of the preference index, Mr. Marshall seems rather against preference shares as a matter of principle. All I can say is that at my end of the business I find it very valuable to watch this ratio and it directly affects our investment policy. When preference shares are at the 1·25 to 1 end of the yield ratio, then I am much more enthusiastic about clients buying them, but when the index moves towards the 1·1 end of the ratio, I encourage them to sell, and on the whole I would have thought that a cycle like that is the sort that is likely to recur.

Then there was a reference to Mr. Hemsted's technique. I do not think that this technique assumes that growth is intended to go on forever. The way I interpret it is that the system is designed to give a short-term forecast of the likely progress of the profits over the next few years. As further accounts come out the forecast is changed. It is, in fact, a forecast of likely progress which is continually being up-dated.

There was a reference to Figure 2 where we have the four charts on one page and to the fact that the up-turn in the dividend was rather microscopic. Well, I must admit that criticism. It looked a little bigger on the original diagram and I still think there was evidence of improving dividends at that stage. This theme about the dividends turning up before the profits was discussed in our previous paper using the *Financial Times*' profits figures. Using this technique there was a distinct up-turn in dividends in September 1962.

There has been a certain amount of comment on the Bank of New York study. Well, this of course, is a very big subject which we could not deal with in any detail. I can say that I have been to New York: I have met the people concerned, and I have had the privilege of seeing their working material and I am very glad to say that a Vice-President of the Bank of New York, Mr. James Wood, is in our audience here tonight. I do not think that the questioner quite appreciated how this technique is used. As I see it, the technique is to get all this data about the growth rates and that kind of thing, as we have described, and to do this elaborate regression analysis. This produces lists of shares which are cheap or dear in terms of the criteria that have been adopted. This regression analysis takes account of most of the factors that the market itself employs: the market has its own methods, whatever they are, of assessing the shares, giving different values to these different factors, and on those criteria we get groups of shares which seem to be below the theoretical price or above. But nobody should suggest that this result is automatically taken as the last word; that is just where we start. Having got shares which on the elaborate

analysis are above or below the normal price, we then look further into them and say, " Well, why is this ? " and in some cases there will be an obvious reason. I was quite impressed when I was talking to Mr. Whitbeck in New York, and he showed me the month's analysis and said, " Well, this one is always far too dear, but, of course, the reason is that it is one of these companies where there is a take-over theme always in the background." That seemed to me quite an interesting example of the use of the technique ; it gives a clue which is investigated critically. In the original article in the *Financial Analysts Journal* some very impressive figures were given as to the success of this technique. Quarter by quarter the results were taken and the shares whose prices were shown to be below the normal did better than the average, and the ones with prices above the normal did not do so well as the average ; consistently these results came out, and I felt that that was very convincing. If anybody wants to study this system in more detail I can obtain the original article which describes this technique fully.

I must thank Mr. Macaulay for the most interesting description of his Local Authority technique and I am very pleased indeed to hear of the way that is working out and the results he has obtained. It seems to me most important, particularly in classes like that, that the performance should be closely watched.

There is a rather difficult question about paragraph 81 and the long-term trends. We have been rather carried away by our theme and the question " Will I name the trade where it applies ? " has rather floored me, I think. I suppose a year ago I would have said that it applied to the insurance trade, but that has been completely vitiated by subsequent results. I think it is probably more correct to say that long-term trends apply to individual companies that have their particular section of the market which, with any luck, they contrive to keep.

Mr. A. T. Jamieson discussed the question of the assets per share. Well, he has made a very good point there. My main interest is in the earnings on the capital employed. I am sure they would be valuable. We appreciate that the asset values, the amount of the capital employed from the balance sheets, are rather suspect, but I feel sure we would find considerable benefit from studying the earnings on capital employed on an index basis. We were perhaps a little optimistic in suggesting that the ratio of the asset index to the share index might be of great value.

Mr. Binns commented on this business about what proportion of the market the index covers. Well, I must confess that the Stock Exchange produces two booklets giving the value of the whole market but they give a different answer. The coverage is different. One, as Mr. Binns says, is restricted to U.K. registered and managed companies and the other represents all new companies quoted on the Stock Exchange and does include a certain amount of foreign capital ; at any rate we can say that the index does cover the major portion of the market.

Mr. H. W. Haycocks, replying to the discussion, said :—I think you all realise that I am the " theoretical member " of the partnership. It is a great disadvantage, not having done any practical investment, not having worked in an investment department or in a stockbrokers office. As Mr. Jamieson, in his very kind final remarks pointed out, willynilly I was responsible for the calculations of figures under the old index and that experience enabled me to notice the queer things that happened to an index that was not satisfactorily constructed. Now, I think that everybody

realises that these methods, these techniques, in investment analysis are in their infancy: in fact, one might say that British investment analysts are concentrating most of their work on trying to get a suitable terminology—definitions of concepts—and getting accurate information, for example, agitating for better and more accurate information from companies so that it would be reasonable to criticise, so far as this country was concerned, some of these techniques as perhaps being too refined for the data available.

Turning to what Mr. Marshall has said about correlation analysis, the method is used to obtain a relationship between price and certain variables, based on past experience and to obtain thereby a " theoretical " price by which to judge the current price. One uses in the formula the estimated dividend for the next twelve months, and the purpose is to judge whether a share is under-valued or not. Now, the formula is, I agree, entirely empirical: it is based on a somewhat arbitrary choice of suitable variables and there is a difficulty in giving some of them quantitative values. The choice is justified by the closeness of fit, a somewhat dangerous procedure, and I agree with Mr. Marshall that any severe movement in the market might quite well upset the validity of the formula. Other firms in America use formulae which involve different variables: one firm is using a formula which introduces a lagged price as a variable in addition to a measure for reliability or variability and they do not use dividends only as a measure of income, but a mixture of earnings and dividends. There is one firm in this country, I think, that has experimented with this kind of technique. There is no attempt to make absolute forecasts. They consider a possible situation over an average period of three years the central point of which is in say five years' time, and then, use the forecasts to compare securities in such a possible economic situation hoping that even if the situation were somewhat different the comparison would still stand up.

Mr, Marshall—perhaps I misunderstood him—seemed to think that the technique of questioning management was somehow linked with speculation rather than long-term investment. Well, here again, there are differences of opinion and it is again noticeable in America where these techniques are much more developed. I have read recently a book by a well-known American investment analyst where he more or less implied that he had given up forecasting in any literal sense. I do not mean that he had given up analysing past data, but he had given up elaborate forecasting and was concentrating all his staff work on questioning management, not merely talking to the Chairman of the Board of Directors, but talking to the top executives, talking to their competitors and to government agencies that dealt with them, and talking to consumers, and he argued that it was only in this way that one could pick the share of a company which looked somewhat humdrum at the moment yet was likely to prove a glamour stock in the future and this was essentially for the purposes of long-term investment and not just for speculative purposes; in fact, he emphasised that one should hold the stock for a considerable period.

Mr. Jamieson mentioned different index numbers and their different performances. Well, I think this was to be expected. Just as it is necessary, say, in portfolio performance to take into account income as well as capital, so if you are comparing two index numbers you would have to do the same. For instance, take a very simple illustration; suppose an index number of two securities of identical companies, except that one was self-financing and the other borrowed from time to time in the market. The first one's price under stationary conditions would rise relatively to the other simply on

account of self-financing and the *Times* method would give equal weight to both and the index would be the mean price rising gradually in time. The F.T.-Actuaries method would be gradually to move the weight over to the company financing itself in the market and the index would be lower. But, on the other hand, in the case of the first index where there is more saving, so to speak, being done, you get a smaller pay-out. Over a period the extra capital appreciation would compensate for the deficiency in income. Thus when comparing index numbers, one should take into account both capital and income, although in practice this would be perhaps an impossible task.

Mr. Campbell emphasised the spreading of risk. This is an old maxim and a very valuable one and in this field also the United States analysts have been trying to develop new methods. Probably some of you have seen an account given recently in the *Financial Times* of this technique of portfolio selection. The investment analyst is still required because a definite list of stocks, estimated yields over the next twelve months or so, and a set of reliability or variability factors have to be provided. A programme technique is then used to produce for a given, say, variability risk what distribution of securities will give the maximum yield or for a given yield what distribution will give the minimum variability. I do not know to what extent this technique has been used.

With regard to Mr. Binns' remarks, by proper average, we simply meant an average as usually defined. For example, the overall index would be a proper average of the Group indices if it was a weighted mean of those indices. However, the F.T.-Actuaries overall index is not an average of this kind. It can be regarded in the following way; everytime there is a change of weights, we in effect, construct a new index with the new weights, but, if we left it like that there would be awkward breaks so in effect we just tag one index series on to the other. If this is done for the over-all index and also for the Group indices, inconsistencies result if the over-all index is thought of as an average of the Group indices. The new index is regarded as an index of a portfolio and in this case it is not necessary to regard the over-all index as an average of the sub-group indices. Current weights—well, there again, we simply meant " current weights " as usually defined. You could have an index for which the weights were the number of shares existing at the current time and ignore adjustments. This, of course, would result in discontinuities but in an index with a large number of constituents they might be difficult to detect.

Many profound comments have been made which I would like to see in print and think about before attempting to make any further reply.

Mr. Plymen and **Mr. Haycocks** subsequently wrote as follows:

Mr. Gibb suggests that the relative performance of high yielders and low yielders is best resolved by constructing a special cumulative index where the price relative is increased by a factor representing the interest earnings. Such an index demonstrates the combined build up of capital and interest of an equity portfolio and could be used for checking portfolio performance allowing both for interest earnings and capital gains. We agree that this idea has distinct possibilities and would be glad to see some research conducted on these lines.

Finally we must take issue with Mr. Campbell. We agree whole-heartedly with his final two points, but we disagree with some of his remarks about financial analysts, particularly with his suggestion that they might be called

" speculation specialists ". The same attitude was taken up by H. G. Clarke speaking in the Institute discussion.

In the first place analysed data are still only data which are used as a basis for judgment. The analysis seldom provides a definite answer. One hopes that the analysis provides more and better information as a basis for investment judgments. Secondly an investment analyst advises a client or his employer and he must consider the purpose of the investment. This could be speculative but usually it is something different, very often it is long term active investment. Work of this sort is carried out by institutional investors as well as by stockbrokers. In fact, in the U.S.A. where investment analysis is much more developed than here, there are probably more analysts employed by mutual funds, bank trustee departments and other institutional investors than by stockbrokers. In this country the Society of Investment Analysts has some 500 members. We have not analysed the occupation of these members, but if we take their Council as representative, its 11 members include 4 stockbrokers, 5 investment managers, 1 merchant banker and 1 university don. Such analysts would, we feel, be rather offended at being described as speculation specialists.