# INVESTMENT--ASSESSING A MANAGER'S SKILL AND MONITORING THE RISKS 

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#### Abstract

The paper proposes a new way of assessing an investment manager's skill in the day-to-day management of portfolios. The authors argue that traditional investment performance measurement techniques, whilst appropriate for many purposes, do not provide the insights necessary to judge the skill of investment managers. To judge manager skill, it is necessary to consider the activity within the portfolio in terms of the purchases, sales and trades, and to determine the value added by that activity. The paper sets out a framework by which this analysis can be carried out and, by means of examples, indicates how the results can be interpreted. The paper also explores briefiy a number of other issues such as the qualitative aspects of performance monitoring. In writing the paper, the concept of risk in various guises was never far from the authors' minds, and it is true to say that the meaning of risk in the context of assessing manager skill lies at the very heart of the paper.


## KEYWORIS

Manager Skill; Performance Measurement; Risk; Purchases; Sales; Trades

## 1. Introiduction

1.1 For many endowed with the responsibility for the investment of large pools of assets, whether they be directors, trustees, managers or advisers, monitoring the financial aspects of the fund consists of annual audits, investment performance reports and discussions with the investment managers. Investment performance measurement, in this context, is usually limited to the comparison of the return on the assets with that reported by a relevant peer group, as reported by one of the performance measurement organisations.
1.2 We feel that such monitoring, both in respect of performance measurement and the more qualitative aspects, does not achieve all the objectives for which it is intended. Specifically, it reveals little about the skill of investment managers, and the risks they are taking.
1.3 In the main part of the paper we set out a system for measuring performance which we consider is appropriate for assessing managers' skill in the day-to-day management of active investment portfolios. While it is particularly appropriate for 'all equity' portfolios, the methods described can be adapted for any asset class where active trading takes place and a suitable index is available.
1.4 First, however, we touch briefly on the monitoring of the more qualitative aspects of the management of a portfolio, as these are likely to become the subject of increasing focus in the future.

## 2. Portfolio Monitoring-The Qualitative Aspects

2.1 Some of the qualitative aspects of portfolio monitoring have been summarised in Appendix 1 under the following headings:
(1) security,
(2) marketability, and
(3) independence.
2.2 Those who are retained to monitor the investment management of a portfolio, rather than just the health of that portfolio, will, no doubt, have other items on their check list, such as the turnover, the amount of commission, the dealing profit, the proportions of these received by the principal brokers, including, especially, those belonging to the same group as the investment manager. Some or all of these and the other questions listed in Appendix 1 should also be asked regularly by the trustees and the auditors.
2.3 Statistical measures can also provide insight into the manager's approach and philosophy, and the analysis should seek to establish the following:
(a) What are the reasons for the performance achieved over the review period in respect of asset allocation and stock selection?
(b) What is the thinking behind the activity in the account with regard to changes in asset allocation and holdings?
(c) What are the aggregate price/earnings ( $\mathrm{P} / \mathrm{E}$ ) ratio, earnings yield and dividend yield or such other ratios as are relevant to the investment manager's approach?
(d) Whether the resulting performance was the result of good judgement, or whether other influences-e.g. luck-played a significant part. Those aspects that relate to the individual fund manager, as opposed to the house in general, should also be identified.
(e) What has been the policy pursued in terms of the benchmark set?

## 3. Risk

3.1 Risk, in the context of this paper, is the investment management riskthat the individual investments selected in the aggregate perform badly, and achieve investment returns lower than expected. As applied to individual shares, the risk is of underperformance embedded within those shares. We have called this the 'embedded risk'.
3.2 Disciples of modern portfolio theory have confused risk with volatility or variability, and introduced the concept of market risk and company risk. Actuaries have always been wary of this concept, which is too dependent on projecting data associated with historical share prices into the future without making allowance for recent and potential future changes of circumstances.
3.3 The performance measurement houses have long recognised that different portfolios can have different levels of risk, and that this may affect their relative performance, but, to date, no satisfactory method has been propounded to
measure the risk associated with the investment management process, inherent in any portfolio.
3.4 Markowitz used the variance of the mean as a measure of the risk. Variance, of course, measures the dispersion from the mean. For example, consider the problem of a marksman aiming at a bullseye in the middle of a target, scoring 10 for a direct hit on the bullseye and nothing for shots in the surrounding target area. For a poor marksman with an old rifle, the shots will be dispersed widely all around the target. An experienced rifleman, perhaps with a telescopic sight, may achieve almost all direct hits within the bullseye, but, in any event, the dispersion of his shots from the bullseye will be very small. In these circumstances, a large dispersion or variance is clearly a disadvantage as the prospect of direct hits is small. For this special class of risk variance provides a useful assessment.
3.5 The objective for an investment manager running a fund to track a specific index is to keep close to the index with a minimum of error. Here again, to use variance as a measure is reasonable.
3.6 For a good active portfolio performance, however, the objective is not to achieve an exact target, but to obtain the best results within the guidelines laid down. The objective is to penalise underperformance, but to reward outperformance. Within a portfolio, underperformance by some shares is acceptable, provided it is more than offset by outperformance by the remainder of the shares.
3.7 According to the efficient market theory, all shares have the same eventual prospects. Those with an expected higher return carry a higher risk and, presumably, a higher variance, but produce the same net result in the long run. This could well have been true in 1952 when Markowitz wrote his doctoral thesis, because investment statistics and investment analysis were in a rudimentary state. With the enormously improved statistical background and the increased power of computerised analysis, we suggest that it is now possible to find shares that are exceptionally cheap and liable to outperform the market over a reasonable period. Strangely enough, it is often the shares with the higher returns that carry the least risk. Sometimes high variance may even be an advantage, as the possibility exists of profitable trading as the shares move from one end to the other of their trading range.
3.8 The risk associated with a single shareholding is taken as the performance relative to an appropriate index, i.e. whether the contribution adds to or detracts from the relative performance of the portfolio over the year. Obviously, for the progressive shares that are outperforming the market the risk is 'negative', i.e. contributing a profit towards offsetting the losses of the less successful shares.
3.9 The manager's task is to maintain as much as possible of the portfolio in shares where the prospect of outperformance is good and the risk of loss is low. Obviously the performance ranking of the shares is continually changing, and it is a counsel of perfection to expect to retain all the holdings in above-average
performing shares; but this should be the target, and the assessment of its success is a first step in monitoring the success of the manager.
3.10 The ideal manager should sell the risky shares that are going to underperform and should buy some of the progressive shares that are going to outperform the index during the year. The extent to which the manager is successful in this respect can be indicated by comparing the performance of the shares sold with the index. Again, the new purchases should be studied to sec to what extent they have outperformed the index.
3.11 There are thus three factors to be examined:
(1) the performance of the old portfolio,
(2) the performance of the new shares, and
(3) the performance of the sales.

In our system, which is described in the following paragraphs, each of these is calculated regularly and monitored, so that suitable measures can be taken to improve the techniques for decision making.

## 4. The System

4.1 The method of measuring portfolio performance, which we describe in the following paragraphs, shows clearly the actual risk of lower than expected returns in cash terms associated with any particular portfolio or any particular share, a year in arrear. For the purposes of monitoring managers' skill, this is a more useful tool than the volatility-based measure often used to describe a portfolio's 'risk'.
4.2 Traditionally, portfolio performance measures were obtained directly from an analysis of the balance sheet and revenue account. This measure was found wanting, because it could not adequately reflect the effects of substantial cash flows at irregular intervals. In its place a time-weighted measure evolved.
4.3 Nearly all of the portfolio performance measures currently in use today are based on the total return on the fund, including both capital and income. Strictly, in order to produce accurate time-weighted figures, the accounts should be constructed each day that there is a cash movement in or out of the fund. In practice, the accounts are constructed on a quarterly basis, using approximations based on what is supposed to be the relevant index to estimate the market value of the fund at the intermediate dates.
4.4 Compressing the data into single measures averaged over the quarter makes for errors and, also, for considerable confusion as to the meaning and significance of the time-weighted returns. Since an index is already used in order to obtain the time-weighted rate of return, why not base the performance measure more directly on that index?
4.5 The difference between the rate of return on the portfolio and the corresponding return on the index is made up of two components, the difference between the income returns and the difference between the capital returns. The
difference between the income returns is readily calculated from either the accounts or the regular market valuations of the fund. For an all equity portfolio, the annual dividend yield on the index might be, say, $5 \cdot 0 \%$ compared with $5.4 \%$ on the portfolio. Thus, the portfolio gains $0.4 \%$ each year in income.
4.6 For a mixed portfolio with, say, $60 \%$ in equities yielding $5.0 \%$ in line with the index and $40 \%$ in bonds yielding $10.0 \%$, the overall yield is $7 \cdot 0 \%$, an income gain of $2.0 \%$ over the equity index. Clearly the excess income factor is readily calculated, changes very slowly and, for a diversified portfolio, is almost devoid of risk. For a factor with these characteristics, annual calculations are usually all that are required, and there is no need for frequent computation.
4.7 In contrast, the capital return factor has completely different characteristics. It is very volatile, varying from day to day with share price movements, and carries a considerable degree of risk. Consequently, it seems logical to concentrate the detailed performance comparison on this factor and this factor alone, using the process of capital unitisation.
4.8 The system is very simple. All that is required is to take every movement in and out of the portfolio and divide the amount by the current price of the index, thus converting the monetary consideration into units of the index. In effect, a parallel fund is established, the units moving exactly in line with the index. At any point in time the market value of the index fund can be determined by taking the product of the number of units and the index price. The actual value of the portfolio can be compared to that of the parallel fund to give the relative performance.
4.9 The process is accurate, involves no averaging or approximations, and can be carried out as frequently as required, subject only to the availability of a portfolio valuation. In practice, for a large fund, weekly comparison is valuable, as it enables the manager to discern, immediately, any adverse trends which are developing.
4.10 If a rigorous determination of performance is required, it will be necessary to unitise both capital and income. Similarly for unit trusts, like the one employed as our second example, dividends are also capitalised and included in the total value. The comparison, of course, being made with a rolled-up index. Such full-scale unitisation, however, is a formidable task, is expensive and requires a considerable volume of frequent inputs. In contrast, capital unitisation is very easily carried out and can be completely automated.

## 5. An Example

5.1 Plymen manages the assets of a professional society with the assistance of a stockbroker. The small fund represents the society's free reserves, which cushion the effect of operating losses on the subscription rate. As the liabilities for rents, wages, salaries and other expenses are covered by subscriptions, the portfolio, for most of the time, is fully invested in equities. The investment target is to outperform the FTA All-Share Index by some 1-3 percentage points per annum.

Table 5.1. Value of 1991 Opening Portfolio at 31.12.91

|  |  | Units at 31.12.90 | Value at 31.12.91 |  |  |  | Profit/(Loss) |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | value at $31.12 .90$ |  | Calls | Units at $31.12 .91$ | Market value at $31.12 .91$ <br> ¢ | Equivalent index value $£$ | £ | \% |
| Britannic | 32,325 | 31.32 |  | 31.32 | 42,628 | 37,193 | 5,435 | 14.6 |
| Northern Electric | 7,350 | $7 \cdot 12$ | $2 \cdot 83$ | 9.95 | 13,500 | 11,823 | 1,677 | 14.2 |
| United Friendly | 32,612 | 31.59 |  | 31.59 | 42,780 | 37,523 | 5,257 | 14.0 |
| Prudential | 10,388 | 10.06 |  | 10.06 | 13,144 | 11,952 | 1,192 | 10.0 |
| London Electric | 6,925 | 6.71 | 2.83 | $9 \cdot 54$ | 12,350 | 11,334 | 1,016 | $9 \cdot 0$ |
| BTR | 9,734 | 9.43 |  | 9.43 | 12,184 | 11,200 | 984 | 8.8 |
| Sainsbury | 17,499 | 16.95 |  | 16.95 | 21,489 | 20,134 | 1,355 | 6.7 |
| BAT | 23,080 | 22.36 |  | 22.36 | 25,120 | 26,556 | $(1,436)$ | (5.4) |
| Hanson | 5,904 | $5 \cdot 72$ |  | 5.72 | 6,400 | 6,793 | (393) | (5.8) |
| Northumbrian Water | 8,649 | 8.38 | 1.75 | 10.13 | 10,695 | 12,032 | $(1,337)$ | (11-1) |
| British Petroleum | 11,690 | 11.32 |  | 11.32 | 10,258 | 13,450 | $(3,192)$ | (23.7) |
| Sun Alliance | 30,360 | 29.41 |  | 29.41 | 26,404 | 34,932 | $(8,528)$ | (24.4) |
| Total | 196,516 | 190.38 | 7.41 | 197.78 | 236,952 | 234,922 | 2,030 | 0.9 |

Note: The total percentage profit shown is not the total of the individual shares' percentage profits.
5.2 Because of the size of the portfolio, the number of shares is small by institutional portfolio standards. With such a small portfolio, it is not really practicable to attain a normal index-stylc spread, as this would involve holding as a minimum some 50 shares, which would be excessively expensive to manage. Instead, the investments were limited to some 10-15 holdings, carefully selected and closely monitored with the help of detailed investment analysis. The manager has explained that his prime objective is to stay in shares that are cheap with above-average long-term prospects.
5.3 The tables in Appendix 3 show the portfolios held as at 31 December 1990, 31 December 1991 and 31 December 1992, with the transactions made during each of the 2 years.
5.4 The first stage in our proposed system was to unitise the holdings. The unitisation display in respect of the portfolio held at 31 December 1990 as at that date, and as revalued as at 31 December 1991, is set out in Table 5.1.
5.5 Within these valuations and the accompanying schedules, figures for every holding were recorded in terms of market valuation and the number of supporting units. Multiplying these unit numbers by the FTA All-Share Index at 31 December $1991(1,187 \cdot 70)$ gave the index value of the original fund at that time. The new shares purchased during the year (Table 5.2), the shares sold during the year (Table 5.3) and the trades (Table 5.4) were unitised. It follows that the figures for the actual fund as at 31 December 1991, after adjustment for the trades in the year, must agree with those for the original fund plus the purchases minus the sales.
5.6 In the tables which follow:

Equivalent Index Value means the actual value of a stock or portfolio at a valuation date, or at the date of purchase or sale, increased in line with the relevant index (rather than the actual experience of the stock or portfolio) to the measurement date.
Profit/(Loss) is calculated relative to the equivalent index value.
Units of the Index are determined by taking the actual value of a stock or portfolio and dividing by the value of the relevant index.
Units Purchased/Sold are the number of units that are equivalent to the purchase/ sale consideration of a stock that is purchased/sold.
Trades are where equivalent purchases and sales occur within the same year.

Table 5.2. Value of Purchases at 31.12.91

|  |  | Units purchased | Market value at | Equivalent | Profit/(Loss) |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $\underset{£}{31.12 .91}$ | index value f | £ | \% |
| 4000 | National Power | 4.05 | 5,780 | 4,810 | 970 | 0.4 |
| 4000 | Powergen | $4 \cdot 19$ | 6,220 | 4,976 | 1,244 | 0.5 |
| 3000 | Southern Water | 7.64 | 7,260 | 9,074 | $(1,814)$ | (0.8) |
| 3900 | Scottish Power | 3.79 | 3,997 | 4,501 | (504) | (0.2) |
| 3900 | Scottish Hydro | 3.99 | 4,075 | 4,739 | (664) | (0.3) |
| Call (70p) | Southern Water | $1 \cdot 70$ | 2,100 | 2,019 | 81 | 0.0 |
| 3000 | BR Telecom | 8.93 | 9,855 | 10,606 | (751) | (0.3) |
| 2100 | Scottish Hydro | 1.85 | 2,195 | 2,197 | (2) | (0.0) |
| 2000 | Scottish Power | 1.81 | 2,153 | 2,150 | (3) | (0.0) |
| 2000 | Perkins Foods | $2 \cdot 63$ | 2,860 | 3,124 | (264) | (0.1) |
| 2000 | BR Telecom | 5.88 | 6,570 | 6,984 | (414) | (0.2) |
| 6000 | Sun Alliance | $15 \cdot 18$ | 17,220 | 18,029 | (809) | (0.3) |
|  | Total | 61.64 | 70,285 | 73,209 | $(2,924)$ | (1-2) |

Table 5.3. Value of Sales at 31.12.91

|  | Units sold | Market value at <br> 31.12 .91 | Equivalent <br> index value | Profit/(Loss) |  |  |
| :--- | :--- | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $£$ | $£$ | $£$ | $\%$ |
| 3200 | Sun Alliance | $10 \cdot 38$ | 9,184 | 12,328 | 3,144 | $1 \cdot 3$ |
| 1200 | BAT | $6 \cdot 91$ | 7,536 | 8,207 | 671 | $0 \cdot 3$ |
| 700 | BAT | $4 \cdot 18$ | 4,396 | 5,965 | 569 | $0 \cdot 2$ |
| 2200 | Prudential | $3 \cdot 21$ | 5,456 | 5,000 | $(456)$ | $(0 \cdot 2)$ |
| 1600 | Prudential | $3 \cdot 07$ | 3,968 | 3,646 | 322 | $(0 \cdot 1)$ |
| 1500 | Prudential | $2 \cdot 79$ | 3,720 | 3,314 | $(406)$ | $(0 \cdot 2)$ |
| 1000 | United Friendly | $3 \cdot 18$ | 3,450 | 3,777 | 237 | $0 \cdot 1$ |
| 1200 | Britannic | $8 \cdot 60$ | 10,234 | 10,214 | $(20)$ | $(0 \cdot 0)$ |
| 6000 | Sun Alliance | $15 \cdot 44$ | 17,220 | 18,338 | 1,118 | $0 \cdot 5$ |
| 2500 | United Friendly | $8 \cdot 49$ | 9,660 | 10,084 | 424 | $0 \cdot 2$ |
| 3200 | Hanson | $5 \cdot 27$ | 6,400 | 6,259 | $(141)$ | $(0 \cdot 1)$ |
|  | Total | $72 \cdot 52$ | 81,224 | 86,132 | 4,908 | $2 \cdot 1$ |

## Table 5.4. Value of Trades during 1991

Units bought Units sold Profit/Loss
570 Sainsbury 'New'

| Nil Pd | 0.25 | 0.1 |
| :--- | :--- | :--- |
| Total | 0.25 | 0.1 |

Table 5.5. 1991 Relative Performance

|  | Units | Market value at $31.12 .91$ <br> £ | Equivalent index value £ | Profit/(Loss) |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Opening Portfolio | 197.78 | 236,952 | 234,922 | 2,030 | 0.9 |
| Plus: Purchases | 61.64 | 70,285 | 73,209 | $(2,924)$ | (1.2) |
| Subtotal | 259.42 | 307,237 | 308,131 | (894) | (0.3) |
| Less: Sales | 72.52 | 81,224 | 86,132 | 4,908 | $2 \cdot 1$ |
| Subtotal | 186.90 | 226,013 | 221,999 | 4,014 | 1.8 |
| Trades | 0.25 |  | (294) | 294 | $0 \cdot 1$ |
| Total | 186.65 | 226,013 | 221,705 | 4,308 | 1.9 |

5.7 Table 5.5 demonstrates the result of the year's investment management. The whole portfolio had outperformed the index by $1.9 \%$ by 31 December 1991. The opening portfolio, had it been left unaltered until the end of the year, would have shown a gain of $0.9 \%$. Investment management during the year also

Table 5.6. 1991 Monthly Progress of Relative Performance

|  | Market value £ | Index (capital only) | Number of units | Equivalent index value | Performance relative | Cumulative gain \% |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 31.12 .90 | 196,516 | 1,032.25 | 190.38 | 196,516 | $100 \cdot 0$ |  |
| 31.1 .91 | 201,992 | 1,036.24 | 190.38 | 197,279 | 102.4 | $2 \cdot 4$ |
| 28.2.91 | 212,339 | 1,150.01 | 180.00 | 207,002 | $102 \cdot 6$ | 2.6 |
| 31.3.91 | 230,876 | 1,193.33 | 188.97 | 225,504 | $102 \cdot 4$ | $2 \cdot 4$ |
| 30.4.91 | 239,004 | 1,202.75 | 188.97 | 227,284 | $105 \cdot 2$ | $5 \cdot 2$ |
| 31.5.91 | 242,994 | 1,201.85 | 188.97 | 227,114 | 107.0 | 7.0 |
| 30.6 .91 | 231,351 | 1,161-19 | 185.29 | 215,157 | $107 \cdot 5$ | 7.5 |
| 31.7 .91 | 244,986 | 1,235.89 | 188.49 | 232,953 | 105.2 | $5 \cdot 2$ |
| 31.8 .91 | 249,612 | 1,268.62 | 188.49 | 239,122 | $104 \cdot 4$ | $4 \cdot 4$ |
| 30.9 .91 | 257,834 | 1,265.96 | 188.49 | 238,620 | 108.1 | 8.1 |
| $31.10 \cdot 91$ | 248,158 | 1,238.63 | 188.18 | 233,085 | 106.5 | 6.5 |
| 30.11.91 | 201,350 | 1,168.95 | 165.60 | 193,578 | $104 \cdot 0$ | 4.0 |
| 31.12 .91 | 226,011 | 1,187.70 | 186.66 | 221,696 | 101.9 | 1.9 |
| Total | 226,011 |  | 186.66 | 221,696 | 101.9 | 1.9 |

Note: Readers with an auditing background will note the small discrepancies in certain totals due to rounding errors.
contributed a balance of $1 \cdot 0 \%$, made up of a profit of $2 \cdot 1 \%$ on the sales and a loss of $1.2 \%$ on the purchases, together with a profit of $0.1 \%$ which was recorded from the trades.
5.8 Profits or (losses) on trades have been treated as writing down or (up) the number of units and the equivalent index value. Obviously they do not affect the market value of the continuing portfolio, but contribute to the relative performance.
5.9 Valuations of the actual portfolio held at the end of each month during 1991 were made with a view to tracking the relative performance of the manager progressively throughout the year. These are set out in Table 5.6.

## 6. Analysis of the Performance during 1991

6.1 The 12 constituents of the original portfolio are listed in Table 5.1, showing the market value of each share at 31 December 1991, together with the corresponding index value and the gain or loss over the index. The constituents have been listed in order of their performance. The results are very diverse, ranging from a profit over the index of $14 \cdot 6 \%$ for Britannic to a loss of $24.4 \%$ for Sun Alliance. For the portfolio as a whole the balance shows a profit over the index of $£ 2,030$.
6.2 In effect, this investigation shows the real risk of underperformance for each holding and for the portfolio as a whole, a year in arrear.
6.3 It can be seen that the original portfolio has performed reasonably satisfactorily, as 7 out of 12 shares are in the above-index category, with only 5 performing poorly. The two largest holdings, Britannic and United Friendly, with profitability of $14 \cdot 6 \%$ and $14 \cdot 0 \%$, contributed more than $£ 10,000$ to the year's results.
6.4 Table 5.6 shows the successive monthly performance figures over 1991. For the first 6 months the performance was well ahead of target, with the score up to $+7.5 \%$ by 30 June. However, by the end of the year the performance had deteriorated to show a return of only $+1.9 \%$, but was still within the target range specified.
6.5 The fall was almost entirely attributable to the severe decline in the share price of Sun Alliance. For the first 3 months of the year, ahead of their results, Sun Alliance shares followed their usual course of tracking the index. After that the price declined each month. The managers anticipated a deteriorating situation to the extent that they sold one-third of the Sun Alliance holding the previous February. They failed, however, to monitor the holding closely and to notice the dramatic change in the trend of the share price. Their mistake was to defer the sale of the balance until the end of the year.

## 7. Analysis of the Performance during 1992

7.1 The whole process was repeated in respect of 1992, starting with the portfolio actually held as at 31 December 1991. The tables in respect of 1992 are set out below, and correspond to the 1991 tables shown in Section 5.

Table 7.1. Value of 1992 Opening Portfolio at 31.12 .92

|  | Market | Units at$31.12 .91$ | Calls | Value at 31.12.92 |  |  | Profit/(Loss) |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | value at $31.12 .91$ |  |  | Units at $31.12 .92$ | Market value at $31.12 .92$ | Equivalent index value |  |  |
|  | £ |  |  |  | 1 | £ | £ | \% |
| United Friendly | 29,670 | 19.92 |  | 19.92 | 43,258 | 27,167 | 16,091 | $59 \cdot 2$ |
| Sainsbury | 21,489 | 16.95 |  | 16.95 | 32,148 | 23,116 | 9,032 | 39.1 |
| Northern Electric | 13,500 | 9.95 | $3 \cdot 12$ | 13.07 | 24,075 | 17,825 | 6,250 | 35.0 |
| Britannic | 32,395 | 22.72 |  | 22.72 | 41,781 | 30,985 | 10,796 | 34.8 |
| BAT | 13,188 | 11.27 |  | 11.27 | 20,643 | 15,370 | 5,273 | 34.3 |
| BTR | 12,184 | 9.43 |  | 9.43 | 17,157 | 12,861 | 4,296 | 33.4 |
| Northumbrian Water | 10,695 | 10.13 |  | 10.13 | 18,104 | 13,815 | 4,289 | 31.0 |
| National Power | 5,780 | 4.05 | $2 \cdot 48$ | 6.53 | 11,400 | 8,906 | 2,494 | 28.0 |
| London Electric | 12,350 | 9.54 | $3 \cdot 12$ | $12 \cdot 66$ | 21,850 | 17,266 | 4,584 | 26.5 |
| Powergen | 6,220 | $4 \cdot 19$ | $2 \cdot 48$ | $6 \cdot 67$ | 11,400 | 9,096 | 2,304 | 25.3 |
| Scottish Hydro | 6,270 | $5 \cdot 84$ | $3 \cdot 37$ | 9.21 | 15,600 | 12,561 | 3,039 | 24.2 |
| Scottish Power | 6,150 | $5 \cdot 60$ | $3 \cdot 37$ | 8.97 | 14,580 | 12,233 | 2,347 | 19.2 |
| Southern Water | 9,360 | 9.34 |  | 9.34 | 14,280 | 12,738 | 1,542 | $12 \cdot 1$ |
| British Telecom | 16,425 | 14.81 |  | 14.81 | 20,175 | 20,198 | (23) | (0.1) |
| Sun Alliance | 17,220 | 19.03 |  | 19.03 | 20,880 | 25,953 | $(5,073)$ | (19.5) |
| British Petroleum | 10,255 | $11 \cdot 32$ |  | 11.32 | 8,680 | 15,438 | $(6,758)$ | (43.8) |
| Perkins Food | 2,860 | $2 \cdot 63$ |  | 2.63 | 1,740 | 3,587 | $(1,847)$ | (51.5) |
| Total | 226,011 | 186.72 | 17.94 | $204 \cdot 66$ | 337,751 | 279,115 | 58,636 | 21.0 |

7.2.1 Table 7.1 shows the return which should have been secured from the 17 constituents held at 31 December 1991 if they had been left unaltered for the year. No less than 14 of the constituents recorded a profit, ranging from $£ 16,091$ ( $59.2 \%$ ) for United Friendly to $£ 1,542(12 \cdot 1 \%)$ for Southern Water. The most significant losses were from BP and Perkins Food, being £6,758 (-43.8\%) and $£ 1,847$ ( $-51 \cdot 5 \%$ ), respectively.
7.2.2 For the whole portfolio the market valuation at the end of the year was $£ 337,751$, compared with an index value of $£ 279,115$. Consequently, the notional gain over the index for the original portfolio comes to $24 \cdot 6 \%$, a small part of which has been carried forward from the previous year.
7.3 It is important to investigate, first, how the portfolio came to be so well placed at 31 December 1991, and secondly, why the managers considered it necessary to alter the portfolio during the year, thereby reducing the relative return.
7.4 Further analysis reveals that the reason for the better relative performance lies in the way that the recession affected dividend declarations. Up to 1991, dividends on U.K. equities were still growing at rates of between $5 \%$ and $15 \%$ p.a. During 1992, however, dividend growth for many companies and for many industries came to a sudden halt, and a significant proportion of dividends were actually reduced. The extent of this change of dividend practice varied according to the type of industry. The capital intensive companies in the manufacturing sector showed evidence of dividends actually declining over the year. On the

Table 7.2. Value of Purchases at 31.12.92

|  |  | Units Purchased | Market value at 31.12 .92 | Equivalent index value | Profit/(Loss) |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | £ | £ | £ | \% |
| 3,000 | Seeboard |  | 10.74 | 14,175 | 14,647 | (472) | (0.2) |
| 1,000 | Wellcome | 7.86 | 9,670 | 10,719 | $(1,049)$ | (0.4) |
|  | Total | 18.60 | 23,845 | 25,366 | $(1,521)$ | (0.6) |

other hand, for certain classes of retailers, consumer goods shares and some service companies, dividend increases were still evident at only slightly reduced rates.
7.5.1 The managers of this portfolio have always selected the companies with the maximum expected yield and with the best possible prospects of high continuing dividend growth. For almost all the companies whose shares were held at 31 December 1991, dividend growth during 1992 has continued at a good rate and appears likely to continue for the future. (In particular the holdings in the utility sector, which were introduced during 1991, performed well as regards dividend increases in 1992.)
7.5.2 In 1991 the selected portfolio achieved dividend growth much the same as that on the whole range of index companies, and, consequently, the performance of the selected group was only marginally better than the average.
7.5.3 For 1992, however, the selected group continued to enjoy substantial dividend increases, which were much above the average for the market generally. In these circumstances, the performance of the selected shares was generally well above the average of the market as a whole.
7.6 For two companies with considerable overseas earnings (BAT Industries and BTR) this was even more marked, because the fluctuating exchange rates between sterling and the dollar had the effect of reducing the 1991 profits and increasing the 1992 profits.

Table 7.3. Value of Sales at 31.12.92

|  |  | Units sold | Market value at$\begin{gathered} 31.12 .92 \\ £ \end{gathered}$ | Equivalent index value £ | Profit/(1 oss) |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | ¢ |  |  | \% |
| 800 | Britannic |  | 5.51 | 8,796 | 7,514 | $(1,282)$ | (0.5) |
| 7,000 | BAT | $4 \cdot 47$ | 6,881 | 6.096 | (785) | (0.3) |
| 2,000 | Perkins | 0.94 | 1,740 | 1,282 | (458) | (0.2) |
| 2,000 | Sainsbury | $7 \cdot 43$ | 11,280 | 10,133 | $(1,147)$ | (0.4) |
| 1,700 | Sainsbury | 6.42 | 9,588 | 8,756 | (832) | (0.3) |
| 1,000 | Scottish Hydro | 1.60 | 2,600 | 2,182 | (418) | (0.2) |
| 6,000 | Scottish Power | $9 \cdot 54$ | 14,580 | 13,011 | $(1,569)$ | (0.6) |
| 6,000 | Sun Alliance | 15.10 | 20,880 | 20,593 | (287) | (0.1) |
|  | Total | 51.01 | 76,345 | 69,567 | $(6,778)$ | (2.5) |

Table 7.4. Value of Trades during 1992

|  |  | Units bought | Units sold | Profit/(Loss) |
| :--- | :--- | :---: | :---: | :---: |
| 4,000 | Sun Alliance | 8.72 | 9.02 | 0.3 |
| 5,000 | Royal | 7.71 | 7.89 | 0.2 |
| 4,000 | Scottish Hydro | 3.55 | - | - |
|  | Call Paid | 2.25 | 6.46 | 0.7 |
|  | Total | 22.23 | 23.37 | 1.2 |

7.7.1 Since the original portfolio was so well placed, there was no need for the managers to make any changes, apart from selling the two loss makers, BP and Perkins. We, therefore, enquired as to the reason for the transactions which are listed in Tables 7.2 and 7.3 .
7.7.2 It would appear that the managers received specific instructions from the treasurer of the society to make some sales to build up liquidity to $£ 25,000$ to cover anticipated operating losses due to the effect of the recession on the society's professional activities. This amount was raised by selling parts of overweight holdings. Altogether some 7 holdings were reduced for this reason. Unfortunately, all the sales were made at a loss relative to the index value, resulting in a deterioration of the overall performance. Table 7.5 shows the results of the year's working. These transactions, together with small relative losses on the two purchases and the trading profits, effectively reduced the outperformance from a possible $22 \cdot 2 \%$ to a final figure of $20 \cdot 3 \%$, discounting $1.9 \%$ carried forward from 1991.
7.8 The trading transactions referred to above were examined in more detail4,000 Sun Alliance shares were bought on 27 February at a cost of $£ 10,725$ and

Table 7.5. 1992 Relative Performance

|  | Units | Market value at <br> 31.12 .92 | Equivalent <br> index value | Profit/(Loss) |  |
| :--- | :---: | :---: | :---: | :---: | :---: |
|  |  | $£$ | $£$ | $£$ | $\%$ |
| Opening Portfolio | 186.72 |  | 254,647 |  |  |
| Calls | 17.94 |  | 24,466 |  |  |
| Subtotal | 204.66 | 337,751 | 279,113 | 58,638 | $25 \cdot 1$ |
| Plus: Purchases | 18.60 | 23,845 | 25,366 | $(1,521)$ | $(0.6)$ |
| Subtotal | $223 \cdot 26$ | 361,596 | 304,479 | 57,117 | $24 \cdot 5$ |
| Less: Sales | $51 \cdot 01$ | 76,345 | 69,567 | $(6,778)$ | $(2 \cdot 9)$ |
| Subtotal | $172 \cdot 25$ | 285,251 | 234,912 | 50,339 | $21 \cdot 6$ |
| Trades | $(1 \cdot 14)$ |  | $(1,554)$ | 1,554 | 0.6 |
| Total | $171 \cdot 11$ | 285,251 | 233,358 | 51,893 | $22 \cdot 2$ |

Note: Opening portfolio units tally to the first decimal place only with closing units from
Table 5.5 because of rounding errors.

Table 7.6. 1992 Monthly Progress of Relative Performance

|  | Market <br> value | Index <br> (capital only) | Number of <br> units | Equivalent <br> index value | Performance <br> relative | Cumulative <br> gain <br> $\%$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 31.12 .91 | 226,011 | $1,187 \cdot 70$ | $186 \cdot 72$ | 221,767 | $101 \cdot 9$ | $1 \cdot 9$ |
| 31.1 .92 | 222,066 | $1,223 \cdot 33$ | $176 \cdot 58$ | 216,016 | $102 \cdot 8$ | $2 \cdot 8$ |
| 28.2 .92 | 230,744 | $1,226 \cdot 46$ | $185 \cdot 30$ | 227,263 | $101 \cdot 5$ | $1 \cdot 5$ |
| 31.3 .92 | 204,767 | $1,171 \cdot 71$ | $183 \cdot 92$ | 215,501 | $95 \cdot 0$ | $(5 \cdot 0)$ |
| 30.4 .92 | 245,817 | $1,282 \cdot 75$ | $183 \cdot 92$ | 235,923 | $104 \cdot 2$ | $4 \cdot 2$ |
| 31.5 .92 | 259,020 | $1,311 \cdot 79$ | $183 \cdot 92$ | 241,264 | $107 \cdot 4$ | $7 \cdot 4$ |
| 30.6 .92 | 257,400 | $1,216 \cdot 62$ | $183 \cdot 92$ | 223,761 | $115 \cdot 0$ | $15 \cdot 0$ |
| 31.7 .92 | 223,504 | $1,143 \cdot 14$ | $163 \cdot 15$ | 186,503 | $119 \cdot 8$ | $19 \cdot 8$ |
| 31.8 .92 | 224,823 | $1,096 \cdot 99$ | $163 \cdot 15$ | 178,974 | $125 \cdot 6$ | $25 \cdot 6$ |
| 30.9 .92 | 238,593 | $1,206 \cdot 16$ | $163 \cdot 24$ | 196,894 | $121 \cdot 2$ | $21 \cdot 2$ |
| $31.10 \cdot 92$ | 246,857 | $1,256 \cdot 67$ | $163 \cdot 24$ | 205,139 | $120 \cdot 3$ | $20 \cdot 3$ |
| $30.11 \cdot 92$ | 268,635 | $1,313 \cdot 02$ | $171 \cdot 10$ | 224,658 | $119 \cdot 6$ | $19 \cdot 6$ |
| $31.12 \cdot 92$ | 285,251 | $1,363 \cdot 79$ | $171 \cdot 10$ | 233,344 | $122 \cdot 2$ | $22 \cdot 2$ |
| Total | 285,251 |  | $171 \cdot 10$ | 233,344 | $122 \cdot 2$ | $22 \cdot 2$ |

sold on 4 March for $£ 11,075$, a profit of $£ 350 ; 5,000$ Royal, bought on 24 March for $£ 9,103$, were sold 2 days later at $£ 9,350$, with a profit of $£ 247 ; 4,000$ Scottish Hydro, bought on 4 March at the cost of $£ 4,357$, were sold on 13 July for $£ 4,872$, the profit being $£ 515$. Trading produced a cash profit of $£ 1,110$, or $£ 1,554$ relative to the index. This represented slightly under $0.5 \%$ of the value of the portfolio.
7.9 The profit from the trades, which typically represents some $3 \%$ of the value of the holdings, was small, bearing in mind the risks involved. A skilled trader should buy stock when it is $10 \%$ cheap, hold it until it is fairly priced, making a turn of, say, $8 \%$ of the value. The Royal deal, snatching a profit of $£ 247$ in 3 days, was, in fact, a mistake. The stock was sold at $£ 9,350$ on 26 March at a net price of 187 p. By 31 December 1992 the price had risen to 270 p, valuing the holding at $£ 13,500$. This premature sale, therefore, resulted in a loss of performance relative to the index of $£ 2,740$.
7.10 An attempt to find the motives of the managers for the trade in Royal shares revealed that during the 2-year period the price had fallen heavily; for 1991 the high was 491 p , and the low 215 p. For 1992 the corresponding highs and lows were 294 p and 118 p. For each year the price at the low was $55 \%$ below the peak value during the year. Such a stock obviously carries a high variance, which modern portfolio theory would interpret as a high risk. In practice, however, the stock at the price of 240 p on 1 January 1992 was cheap rather than dear, and the embedded risk was clearly negative.
7.11 It will be noted that, in order to examine the 1992 performance, the 1991 units were carried forward. This continuity facilitates the assessment of the management skill over the longer period, but clearly the 1992 performance could have been examined on its own, as was done with the 1991 performance.

82 Investment--Assessing a Manager's Skill and Monitoring the Risks Table 8.1. FTA Group Performance Factors for Year ended 31 December 1992

| Sector |  | Actual | Relative |
| :---: | :---: | :---: | :---: |
| 47 | Water | $149 \cdot 3$ | $130 \cdot 3$ (2) |
| 62 | Banks | 139.9 | 121.7 |
| 48 | Miscellaneous | 139.9 | $121 \cdot 7$ (1) |
| 05 | Electronics | $138 \cdot 5$ | $120 \cdot 4$ |
| 26 | Food Retailing | 134.8 | 117.2 (1) |
| 10 | Other Industrial | 133.7 | 116.3 (1) |
| 45 | Electricity | 131.8 | 114.7 (6) |
| 70 | Other Financial | 130.8 | 113.8 |
| 30 | Media | $130 \cdot 5$ | 113.5 |
| 09 | Motors | $130 \cdot 3$ | 113.4 |
| 35 | Textiles | $126 \cdot 3$ | 109.9 |
| 46 | Telephone Networks | $120 \cdot 2$ | $105 \cdot 3$ (1) |
| 66 | Insurance (Composite) | $120 \cdot 6$ | 104.9 |
| 34 | Stores | $120 \cdot 4$ | $104 \cdot 7$ |
| 40 | Other Groups | $121 \cdot 1$ | $104 \cdot 5$ |
| 44 | Transport | 118.8 | $103 \cdot 3$ |
| 65 | Insurance (Life) | 118.6 | $103 \cdot 1$ (2) |
| 68 | Merchant Banks | 113.8 | $99 \cdot 0$ |
| 22 | Brewers and Distillers | 113.3 | $98 \cdot 3$ |
| 07 | Engineering-General | 113.6 | 98.0 |
| 08 | Metals and Metal Forming | 111.4 | 96.9 |
| 04 | Electricals | 111.4 | 96.9 |
| 41 | Business Services | $110 \cdot 1$ | $95 \cdot 8$ |
| 31 | Packaging and Paper | 109.8 | $95 \cdot 6$ |
| 43 | Conglomerates | $108 \cdot 6$ | $94 \cdot 5$ |
| 25 | Food Manufacturing | 107.6 | 93.6 (1) |
| 29 | Hotels and Leisure | 106.9 | 93.0 |
| 42 | Chemicals | 101.9 | 88.6 |
| 51 | Oil and Gas | $101 \cdot 2$ | $88 \cdot 0$ (1) |
| 02 | Building Materials | 100.8 | 87.7 |
| 27 | Health and Household | 96.5 | $84 \cdot 2$ |
| 06 | Enginecring-Aerospace | $91 \cdot 1$ | $79 \cdot 2$ |
| 03 | Contracting, Construction | 85.8 | $74 \cdot 6$ |
| 69 | Property | 81.7 | $71 \cdot 1$ |
| 67 | Insurance Brokers | $80 \cdot 5$ | $70 \cdot 0$ |

## 8. Further Analysis of Portfolio

8.1 With such a small number of constituents, it is obviously impossible to attempt anything resembling a spread over the 35 groups of the FTA Index. The managers' objective must be to hold the shares in the more profitable industries, avoiding the ones which are likely to underperform over the year. To check on the success of this part of the operation, Table 8.1 has been prepared showing the performance of the 35 industrial groupings over the year from 31 December 1991 to 31 December 1992. The table shows the ratio of the group index figure at 31 December 1992 to that recorded a year earlier. The 12 months' performance
factors vary from 149.3 for the 11 water stocks to 80.5 for the insurance brokers. For those groupings represented in the portfolio, the number of stocks is shown in parentheses in the last column. With the exception of the two shares that performed particularly badly-BP and Perkins-every holding came from those industrial groupings that outperformed the index over the year.
8.2 The top performing group, the Water Stocks with a relative score of 130.3, was represented by Northumbrian Water and Southern Water with relative scores of 131.0 and $112 \cdot 2$. The second best sector, banks, was not represented in the portfolio. In practice, bank shares generally did not put up a sparkling performance. The very favourable index result is presumably due to the takeover of Midland Bank by Hong Kong and Shanghai Banking Corporation at what appears to be a very high price. The third ranking sector was Miscellaneous with a relative performance of $121 \cdot 7$. This sector was represented by British American Tobacco where the score is $\mathbf{1 3 4} \mathbf{3}$. The Food Retailing group ranked fifth with a score of 117.2, and is represented by Sainsbury with a score of $139 \cdot 1$. The next grouping is Other Industrials with a score of $116 \cdot 3$. The constituent here is BTR with a score of $133 \cdot 4$. The seventh ranking group is Electric Utilitics and is represented by 6 stocks with relative scores ranging from 135.0 for Northern Electric to 119.2 for Scottish Power. British Telecom is in the telephone networks sector with a performance only slightly better than the index, both for the group and for the company. As a group the life insurance shares only just outperformed the index with a factor of $103 \cdot 1$. However, for the 2 constituents held by the portfolio the performance factors are 159.2 for United Friendly, 134.8 for Britannic Assurance.
8.3 When selecting the sectors, it is obviously important to go for the better performers and to avoid the less profitable shares. The portfolio shows up well by this test, as the 6 suspect categories at the bottom of the performance table (Building Materials, Health and Household, Engineering-Aerospace, Contracting Construction, Property and Insurance Brokers), have all been avoided.
8.4 In Table 8.2 we show, for every one of the original constituents, the market valuation of the company and the proportion that this valuation bears to the total market and to the total portfolio of $£ 337,751$. At 31 December 1992 the total market valuation of the constituents of the FTA All-Share Index was approximately $£ 575,000$ million. For British Telecom, the third largest component of the Index, the market valuation was $£ 35,000$ million, or $6 \cdot 2 \%$ of the Index. The holding of the fund in this stock was $£ 20,175$, or $6.0 \%$ of the value of the portfolio. Hence for this particular share, the proportionate holding in the fund was very similar to the proportion that the company's valuation bears to the total index valuation. Similarly for BP, the portfolio proportion and the valuation percentage are the same. Consequently, this part of the portfolio moves in line with the corresponding movement of the FTA All-Share Index. In effect, $£ 30,000$ of the fund's assets were indexed and immunised against price movements. This means that about $10 \%$ of the total portfolio was, in effect, an index-tracking operation.

Table 8.2. Value of Original Portfolio at 31.12.92

|  | Market value £ | Value of company |  | $\begin{aligned} & \% \text { of market } \\ & \text { value } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: |
|  |  | £m | $\%$ of total market |  |
| Northumbrian Water | 18,104 | 385 | 0.07 | $5 \cdot 4$ |
| BAT | 20,643 | 14,390 | 2.50 | $6 \cdot 1$ |
| Southern Water | 14,280 | 817 | 0.14 | $4 \cdot 2$ |
| Sainsbury | 32,148 | 9,427 | 1.60 | $9 \cdot 5$ |
| Scottish Hydro | 15,600 | 1,215 | $0 \cdot 17$ | 4.6 |
| United Friendly | 43,258 | 466 | 0.08 | 12.8 |
| Northern Electric | 24,075 | 665 | $0 \cdot 10$ | $7 \cdot 1$ |
| Scottish Power | 14,580 | 2,430 | 0.40 | $4 \cdot 3$ |
| BTR | 17,157 | 10,845 | 1.90 | $5 \cdot 1$ |
| London Electric | 21,850 | 970 | $0 \cdot 17$ | 6.5 |
| National Power | 11,400 | 3,855 | 0.69 | 3.4 |
| Britannic | 41,781 | 714 | $0 \cdot 12$ | $12 \cdot 4$ |
| Powergen | 11,400 | 2,372 | 0.41 | 3.4 |
| British Telecom | 20,175 | 35,000 | $6 \cdot 20$ | 6.0 |
| Sun Alliance | 20,880 | 2,725 | 0.47 | 6.2 |
| British Petroleum | 8,680 | 14,479 | 2.50 | 2.5 |
| Perkins Food | 1,740 | 102 | 0.02 | 0.5 |
| Total | 337,751 |  |  |  |

8.5 Inevitably, such a small number of constituents must make for a very risky portfolio, particularly because about a quarter was held in two shares in the same industry (life insurance). A concentrated portfolio, which differs so greatly from the Index in terms of size of component and distribution by industry, could be expected to show a distinctly erratic performance. Our analysis shows, however, that the taking of firm positions regarding the size and distribution of the components of a portfolio does permit of very considerable success. Following a satisfactory return of $1.9 \%$ in 1991, the 1992 outperformance of $20.3 \%$ over the index was a reward for the successful selection and maintenance policy.

## 9. Another Example

9.1 In order to demonstrate that the system could be operated on a large portfolio, it was felt that the performance of a substantially larger fund should be examined. The authors are, therefore, particularly grateful to the directors of Perpetual PLC who have provided them with full details of the portfolio of the Perpetual American Growth Fund and all bargains transacted for that trust during the period 1 February 1991 to 31 January 1992 (the fund's financial year). The advantage for our purposes of choosing an authorised unit trust is that the fund was fully audited at the beginning and end of the year, and that transactions during the year were readily available.
9.2 The stated objective of this fund is to achieve capital growth in North America. The fund is invested mainly in shares of companies in the United States of America and, to a lesser extent, Canada, although it may also include other
investments that the manager considers appropriate. The Perpetual American Growth Fund is a Collective Investment Scheme within the meaning of the Financial Services Act 1986.
9.3 Units in the fund were initially offered on 24 September 1983 at a price of 50 p. By 31 January 1991 the total value of the fund was $£ 31 \cdot 3 \mathrm{~m}$, the offer price then being $93 \cdot 39$ p. During the year ending 31 January 1992, some $£ 45 \mathrm{~m}$ of new subscriptions were received, the total value of the fund at the end of the year being $£ 91.9 \mathrm{~m}$.
9.4 The annual reports of the fund include a complete list of the investments with each valued as at 31 January. In addition, all portfolio changes are listed under the categories of new holdings, increased holdings, decreased holdings, total disposals, and new holdings bought and sold in the year. At 31 January 1991 there were just 57 holdings. No less than 46 were sold during the ensuing year. The proceeds of these sales, together with the $£ 45 \mathrm{~m}$ of new money, was invested in 64 new holdings. To 8 of the surviving 1991 shareholdings further purchases were added. There were also no less than 132 companies where new holdings were bought and sold in the year ('trades').
9.5 Some $40 \%$ of the portfolio was held in the shares of smaller companies. Since the usual holding for the fund is about $£ 1 \mathrm{~m}$, in order to arrive at this size for smaller companies, deals had to be done in a series of transactions over a period. During the year dealing took place in the shares of around 250 companies, and the total number of bargains amounted to nearly 2,000 .
9.6 Details of deals done by Perpetual American Growth Fund are kept in their computer, so as to be able to print the ledger entries.
9.7 Fortunately the Perpetual ledger display already includes the relevant index figure against each entry, the index for this fund being the FT-Actuaries North American Sterling Series. This index tracks the capital performance, the dividends being distributed. Theoretically, it would be better to use a specially calculated rolled-up index to allow for income.
9.8 Our computer was programmed to unitise each transaction as described in $\S 4 \cdot 8$. The entries were then sorted into stock reference number order. From the list, the individual entries for each stock were combined and allocated to the major classes, i.e. the new purchases, the sales, the trades, etc. For each of the trades the number of units recovered from the sale was deducted from the number of units acquired, multiplied by the index value at the end of the year, to reveal the profit or loss on the transaction. In practice, a profit or loss was recorded according to whether the unit balance in respect of the trade was negative or positive.
9.9 Having dealt with the trades, the purchases and sales were examined. For every movement except the trades, it was necessary to record the market value at 31 January 1992. For the purchases, the end year value was obtained by reference to the valuation at 31 January 1992, given in the annual report.
9.10 For what may be called the old portfolio, reference was made to the valuation at 31 January 1991 shown in the annual report for that year. Unit

Table 9.1. Portfolio Performance in 1991/92

|  | Market value at 31.1.91 | Market | Valuation at 31.1.92 |  | Profit/(Loss) |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Equivalent index value | Sold/ increased |  |  |
|  | ¢000 | £000 | £000 |  | $£ 000$ | \% |
| Top Ten: |  |  |  |  |  |  |
| Stone Container | 446 | 1,129 | 587 | 1 | 542 | 92.3 |
| Reebok International | 358 | 893 | 470 | S | 423 | 90.0 |
| Valley National | 531 | 1,153 | 699 | 1 | 454 | 64.9 |
| Kaufman \& Broad Home | 599 | 1,243 | 788 | S | 455 | 57.7 |
| Federal National Mortgage | 604 | 1,085 | 795 | - | 290 | 36.5 |
| Mobile Telecom | 315 | 565 | 415 | S | 149 | 35.9 |
| Bank of Nova Scotia | 464 | 811 | 610 | S | 201 | 33.0 |
| Georgia Pacific | 543 | 914 | 715 | S | 199 | 27.8 |
| Home Depot | 443 | 688 | 584 | 1 | 104 | 17.8 |
| Morton International | 391 | 599 | 515 | S | 84 | $16 \cdot 3$ |
| Bottom Ten: |  |  |  |  |  |  |
| Warner Lambert | 709 | 776 | 933 | S | (157) | (16.8) |
| Employee Benefit Plans | 551 | 595 | 725 | S | (130) | (17.9) |
| Energy Ventures | 159 | 172 | 210 | - | (38) | (18.1) |
| Puritan Bennett | 650 | 670 | 856 | S | (186) | (21.7) |
| Seagate Technology | 701 | 719 | 923 | S | (204) | (22.1) |
| Caterpillar | 637 | 652 | 839 | S | (187) | (22.3) |
| Alcan Aluminium | 539 | 551 | 709 | S | (158) | (22.3) |
| Deere \& Co | 561 | 560 | 738 | S | (178) | (24.2) |
| Digital Equipment | 549 | 422 | 722 | S | (300) | (41.6) |
| Pool Energy Services | 25 | 17 | 33 | S | (16) | (48.5) |

values were calculated by dividing these market values by the index figure at that date. For this category, the end-year valuations only appear for those stocks that have survived the year's trading. End-year market values for the sales were obtained from a special valuation.
9.11 The second column of Table 9.1 shows the top 10 and bottom 10 holdings of the fund as at 31 January 1991 , listed in terms of performance over the year. The market values of the holdings a year later at 31 January 1992 are given in the next column. The fourth column shows the index value at the same date, i.e., the market value at 31 January 1991, scaled up by the movement of the index over the 12 months. The final columns show the profit as a percentage of the index value, indicating the relative performance of the holding and the profit achieved. The holdings, ordered by performance, start with Stone Container-which beat the index by $92.3 \%$-and, at the other end of the scale, come to Pool Energy Services where the final value was around half of the index figure. For the whole fund, the market valuation at the end of the year was $103 \cdot 2 \%$ of the index figure.
9.12 Of the top 10 shares, four have survived and for three of these the holdings have been increased. On the six sales substantial profits were taken. For example, the second highest performer, Reebok International, which had outperformed the index by some $90 \%$ by the end of the year, was, in fact, sold at a


Figure 9.1. Original portfolio.
profit of more than $£ 500,000$ within a few weeks of purchase. The sales programme included 9 of the bottom 10 performers.
9.13 The performance of the original portfolio, the purchases and the sales are depicted in Figures 9.1 to 9.3, showing the amount of market valuation held in the various decile ranking categories. For this last display the performance factor is that operating for only part of the year, from the date of sale to 31 January 1992. The end-year market values are the same, but the index values are somewhat different, being based on the sale price and only part of a year's market movement. By this reckoning, the total index values for the sales at the end of the year come to $£ 30,166,000$ compared with market values of $£ 29,516,000$. The profit on the sales was $£ 650,000$, this being the effect of selling the mainly dear shares and retaining most of the high fliers.
9.14 In practice, the poor prospects of the dearer shares were recognised at a very early stage and many of them were disposed of in February at high prices, so that a considerable proportion of the expected losses was forestalled.
9.15 During the year the fund gained further subscriptions of some $£ 37$ million, which, together with sales proceeds, made a total amount available for


Figure 9.2. Purchases.
investment of $£ 67,625,000$ in terms of equivalent index value at 31 January 1992. The corresponding market value is $£ 78,870,000$, with a profit of $£ 11,245,000$, or $15 \cdot 2 \%$ of the index value. The average performance factor is $116.6 \%$, with the minimum performer recording $75 \%$, whilst the best result came from holding $£ 235,000$ Consolidated Stores, with a rating factor of no less than $265 \%$. There were several other remarkably successful investments, notably Home Depot with a score of $244 \%$ and Fruit of the Loom with $220 \%$. Altogether the performance of the purchases is remarkable, with a number of investments out-performing the index by more than $100 \%$ in the period from purchase to the end of the year. This result reflects a high degree of selection skill by the manager.
9.16 The turnover amounted to $£ 108$ million. In addition to what might be called normal turnover, there was a considerable volume of trading. Even lumping together those bargains relating the acquisition or sale of the same share, there were 119 trades amounting to $£ 220$ million. This considerable trading activity was not, however, profitable. On the contrary a loss of $£ 385,000$ was sustained.
9.17 Our conclusion is that the managers adopted a policy of running profits and cutting losses. With the weaker shares weeded out, the remaining portfolio


Figure 9.3. Sales.
could be expected to outperform. As an example, this view was confirmed by reference to Figure 9.2, relating to the purchases. A relative performance of between 90 and 110 may be regarded as normal, anything over 110 being cheap and under 90 being dear. As may be seen from Figure 9.2, the cheap stocks represent some $42 \%$ of the total and the dear stocks only $4 \%$. This shows, dramatically, the effects of the initial selection process and the subsequent weeding programme.
9.18 Table 9.2 sets out the performance relative to the index for the whole fund for the year 1991/92. This shows that for the fund valued at $£ 86,544,000$ at 31 January 1992 the profit relative to the index over the year is $£ 12,668,000$ or $17 \cdot 2 \%$ of the equivalent index value of $£ 73,491,000$.
9.19 So far in making our calculations we have used the capital index only. However, the American Fund capitalises the dividends through the price, making the use of the rolled-up index more appropriate than the capital only. It is, of course, impossible to use a rolled-up index in the individual day-to-day calculations, as this index is not yet published on a rolled-up basis. However, for comparisons over the year a correction can be made. The dividend yield on the

Table 9.2. 1991/2 Relative Performance

|  | Market value at <br> 31.1 .92 | Equivalent <br> index value | Profit/(Loss) |  |
| :--- | :---: | :---: | :---: | :---: |
|  | $£ 000$ | $£ 000$ | $£ 000$ | $\%$ |
| Opening Portfolio | 37,190 | 36,032 | 1,158 | $1 \cdot 6$ |
| Plus: Purchases | 78,870 | 67,625 | 11,245 | $15 \cdot 2$ |
| Subtotal | 116,060 | 103,657 | 12,403 | $16 \cdot 9$ |
| Less: Sales | 29,516 | 30,166 | $(650)$ | $(0 \cdot 9)$ |
| Subtotal | 86,544 | 73,491 | 13,053 | $17 \cdot 8$ |
| Trades |  | 385 | $(385)$ | $(0 \cdot 5)$ |
| Total | 86,544 | 73,876 | 12,668 | $17 \cdot 2$ |

FTA American Sterling Series at 31 January 1991 was $2 \cdot 91 \%$ gross or $2 \cdot 18 \%$ net. The capital return on the index for the period from 31 January 1991 to 31 January 1992 was $34 \cdot 2 \%$. Adding to this the net dividend makes a total return of capital and income combined from the index of $\mathbf{3 6 . 4} \%$. On this basis, the gain relative to the rolled-up index comes down from $17.2 \%$ to $15 \cdot 0 \%$.

## 10. Risk, Reward and Variability

10.1 The embedded risk is composed of three components; short-term risk, long-term risk and disaster risk. As reference to almost any share price chart will reveal, short-term risk is cyclical with, very roughly, a 6-monthly period. The distance between the peak and the trough indicates the variability, which is a proxy for the variance. The variability can be attributed to a number of factors, such as market price fluctuations due to investor sentiment, changes in shortterm profit expectations and the accuracy of the fit of the market model. At the trough the price is cheap short term, the risk is low and the scope for reward is high; at the peak the converse is true-the price is dear short term, the risk is at its maximum and corresponds broadly to the variance, and the prospect for shortterm reward negligible.
10.2 When measured against the market, a fully-indexed fund, whose every component is proportionate to its market size, will have no long-term risk. The prices of individual shares constituting the index will, however, fluctuate relative to the index. The investment management programme devised by Barr Rosenberg uses this principle. The fund may hold about 300 securities, depending on the market, closely reflecting the experience of the corresponding index, but for each holding a rigorous market model involving more than 50 fitted parameters is maintained to determine if the stock is cheap. Purchases are confined to stocks which are, say, $10 \%$ cheap, and these are sold when they are within $3 \%$ of the correct price. This system, which takes no long-term risks, is claimed to be able to produce a return of some $4 \%$ above the index return, on average, over time.
10.3 In practice, long-term risk in a portfolio of shares is determined by the extent to which the proportionate holdings of the individual stocks depart from


Figure 10.1. Performance of Sainsbury shares relative to the FTA All-Share Index. Source: Datastream.
their corresponding weight in the index (see §8.6). Usually a fund manager will endeavour to be selective, holding less in those sectors which are unattractive. An aggressive manager will go further and concentrate his coverage on a limited number of sectors, and will, thus, be introducing maximum long-term risk in the expectation of maximum profit if his expectations of sector performance are realised.
10.4 In theory, profitable investment management is a simple process. All that is required is to buy shares when they are cheap, both short and long term. The anomalous situation, whereby a share is really cheap, must inevitably be rectified to provide outperformance relative to the market. The price of each share in the portfolio should be closely monitored to ensure that it is at least keeping up with the market. Having outperformed, should it show signs of lagging it should be sold.
10.5 Figure 10.1 shows the performance of Sainsbury shares relative to the FTA All-Share Index over the 5 years 1988-93. In October 1988 the price relative stood at 0.2 , and for the next 4 years increased steadily to 0.4 in July 1992. In other words, the price relative doubled in just over $3 \frac{1}{2}$ years, which corresponds to an increase of nearly $22 \%$ p.a. Had this share been included as a standard holding in a portfolio of 20 shares, the performance of the whole group would have benefitted by $1.1 \%$ p.a.
10.6 Disaster risk, the third component of embedded risk, hits in every market from time to time. Occasionally some tycoon such as Robert Maxwell or Asil Nadir falls from grace, and a major financial empire disintegrates. At a different level, a number of heavily-geared companies may be driven into liquidation through over-reaching themselves, especially in times of recession. Disaster risk is the risk that a share will become worthless.

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 Investment-Assessing a Manager's Skill and Monitoring the Risks10.7 The U.K. fund is deliberately concentrated at the top end of the market, usually in companies with particularly strong balance sheets. More than half of the 17 holdings in 1991 were in privatised utilities where, currently, the disaster risk is negligible. Of the remainder, all but two were in the top 50 by market capitalisation. The two were life insurance shares with exceptional financial strength. With the disaster risk virtually eliminated, it was not unreasonable to hold only a small number of shares in the portfolio, and to allow some of those to exceed the normal limits.
10.8 The manager of the U.K. fund has concentrated on the long-term risk. From Table 7.1 it can be seen that nearly $£ 36,000$ of the $£ 69,000$ profit generated is attributable to three holdings. Each of these shares has been held in the portfolio for several years. Fundamental analysis revealed that they were cheap. How cheap has been revealed by their history of outperformance over these years. Although in both 1991 and 1992 the holdings were reduced, realising further profits, these three holdings still constituted a third of the portfolio at the end of the year.
10.9 By contrast, the policy of the U.S. fund deliberately permits a very wide range of holdings, including those in high-risk sectors such as oil prospecting. With such a portfolio it is important to be widely diversified with, perhaps, 100 holdings, and to make sure that the size of each holding does not exceed the normal unit size by much. Examination of the portfolio showed that the size of each holding was closely controlled; there appeared to be an upper limit of $£ 2$ million as compared to an average holding of $£ 1 \cdot 2$ million. In this way the disaster risk was limited; if any single share failed, the maximum risk was not much more than $1 \%$.
10.10 It is probably no coincidence that we have chosen for our examples two very successful funds, but it is worth stressing that, although the managers of each have adopted widely differing strategies, the substantial outperformance of each has been due to fundamental analysis and the close monitoring of the securities in the portfolios.

## 11. Conclusion

11.1 As can be seen, the performance measurement system which we have described provides a powerful tool, not only for the trustees or others to judge the success of the manager's investment skill, but also for the managers to improve their performance by drawing attention clearly to both the areas of success and of underperformance.
11.2 This paper was commenced in 1992 and the portfolios chosen to be monitored during that year. Although two portfolios, monitored over 2 years and 1 year respectively, have no statistical significance, the authors were particularly interested to note how, in two totally different markets, traditional investment management techniques based on good fundamental research have produced portfolios which outperformed their respective indices.
11.3 The two examples which we have provided are based on all equity portfolios, one United Kingdom and the other U.S.A. However, the performance of mixed or fixed-interest portfolios can be analysed by the same method, as the income element can be added to produce the overall relative rate of return.
11.4 It is also worth noting that the measurement of return statistic preferred by the authors is readily converted to the internal rate of return, unlike the timeweighted return currently favoured by the consultants, which often bears no calculable relationship to the internal rate of return.

## References

Pegler, R. S. (1948). The actuarial principles of investment. J.I.A., 74, 179.
Markowitz, H. M. (1952). Portfolio selection. The Journal of Finance, VII, 77.
Cootner, P. H. (1962). Random vs systematic changes. Industrial Management Review, 111, 24.
Haycocks, H. W. \& Plymen, J. (1964). The design, application and future development of the Financial Times-Actuaries Index, J.I.A. 90, 267.
Bank Administration Institute (1968). Report.
Brew, J. M. (1970). The Trustees' Meeting-a City daydream. The Investment Analyst, 28.
Society of Investment Analysts (1972). Report.
Cocks, G. (1973). A set of indices for portfolio performance analysis. The Investment Analyst, 36.
Eadie, D. M. (1973). A practical approach to the measurement and analysis of investment performance. The Investment Analyst, 37.
Brumwell, J. C. H. \& Short, E. (1974). Composition of the F.T.-Actuaries Share Indices. J.S.S. 21, 1.
Lindey, G. M. (1975). Pension fund performance-the wood and the trees. The Investment Analyst, 41.

Holbrook, J. P. (1977). Investment performance of pension funds. J.I.A., 104, 15.
Hymans, C. \& Mulligan, J. (1980). The measurement of portfolio performance. Kluwer Publishing Ltd.
Marshall, J. B. (1980). Pension fund performance-a new approach. The Investment Analyst, 56.
Clarkson, R. S. (1981). A market equilibrium model for the management of ordinary share portfolios. T.F.A., 37, 439 \& J.I.A., 110, 17.
Clarkson, R. S. \& Plymen, J. (1988). Improving the performance of equity portfolios. J.I.A., 115, 631.

Plymen, J. (1989). The actuarial background to investment policy. T.F.A. 40, 445.
Arthur, T. G. \& Randall, P. A. (1990). Actuaries, pension funds and investment. J.I.A. 117, 1.
Day, N., Green, S. J. \& Plymen, J. (1991). Active investment models. Proceedings of the 2nd AFIR International Colloquium, 3, 349.
Green, S. J. (1992). Another look at portfolio performance measurement. The Investment Analyst, 92.

## APPENDIX 1

## QUALITATIVE ASPECTS OF PORTFOLIO MONITORING

A check list of the qualitative aspects of portfolio monitoring might include the following:

## 1. Fixed Interest

(a) Security-Whether guaranteed or not, and if guaranteed, by whom and on what security. Credit rating from one of the recognised agencies.
(b) Marketability-The proportion of the issue held. If sizeable, how it relates to normal trading size.
(c) Interdependence-Whether other stocks or shares are held in companies of the same group.
(d) Valuc Whether the yield is compatible with that on similar stocks; if not, the stated value is probably incorrect.

## 2. Equities

(a) Marketability-Capitalisation of company. The proportion of the free capital held, particularly if, say, German, French or Japanese. If sizeable, how this relates to normal trading size.
(b) Interdependence-Is the holding directly related to any other holding in the portfolio?
(c) Value-How does the PER or dividend compare with those of other companies in the same sector?
(d) What proportion of the portfolio is held in small capitalisation vompanies?
(e) Bias-How do the proportions of the 10 largest holdings in the portfolio compare with their weights in the relative index? What are the ten largest relative positions against the index, both positive and negative? What proportion of the fund is held in the 100 largest companies and what in the next 100 ?
(f) Balance-What proportion do shares in the same sector/country bear to the total equity portfolio, and how does this compare with the relevant index?

## 3. Property

(a) Security-Name of lessees, expiry dates of leases and current rents per square foot. How does the latter compare with similar properties?
(b) Interdependence-Relationship, if any, between tenant and investment manager. Relationship, if any, between tenant and companies in which equity or fixed-interest securities are held.

## 4. Cash

Security-Through which banks deposits are made. What is their credit rating and to whom are the deposits lent? Are they held in a pooled account? Rate at which the deposits are lent. How does this compare with published rates?

## 5. Others

## Derivatives

Security-Are there cash or securities to cover the options or futures? Has the portfolio been geared by use of derivatives? How does the total value of the derivatives relate to the equivalent market? How do the prices of the derivatives compare against their fair values? Is there a rational reason for using derivatives?

Currency Hedging
Value-What is the extent as to size and date of the hedge? What is the cost? How does this relate to the yield on the assets being hedged?

## APPENDIX 2

## ANALYSIS OF RETURNS AND RISKS

A.2.1 From a study of the two examples, it is clear that investment management is greatly facilitated if the manager is supplied with statistical material which will assist him in determining, for each share in which he is interested, whether the present price is cheap or dear on both a short-and a long-term view.
A.2.2 In order to assess the cheapness or dearness, it is necessary to have some criterion of value which can be recorded daily and compared historically. The simplest criterion of value is the market price. In the short run a comparison of the price with previous highs and lows gives a crude indicator of value. This indicator will obviously be distorted by any substantial price movements in the market, as represented by the appropriate index. Clearly the indicator will be more significant if the market effect can be eliminated, leaving only the price relative to the index. This factor, known as relative strength, is published by Datastream.
A.2.3 Most share prices fluctuate from day to day and week to week around a long-term trend. Usually there is a significant degree of short-term movement amounting to, perhaps, $15 \%$ of the price on either side of the norm. These shortterm fluctuations are mainly due to differing estimates by market participants of the next year's earnings and dividends. Short-term fluctuations are superimposed on longer-term movements based on the varying estimates the future growth prospects for earnings and dividends. A skilled investor, by use of analysis, should be able to differentiate between these movements to take advantage of favourable trends and protect his funds against adverse ones.
A.2.4 Price movements over 1,3 and 12 months are very useful for showing how the trend has been changing over the past year, but the display is improved by using price relatives, as provided by Datastream, rather than working on price alone.
A.2.5 The relative strength factor would, however, be clearly distorted if there were significant dividend changes over the period, particularly if these were not adequately forecast. Hence, the criterion would become more powerful if the effect of the dividend changes were removed and the criterion of value became the dividend yield relative to the corresponding factor on the index.
A.2.6 This dividend yield rating is a most powerful indicator of cheapness or dearness. If a share yields only $2 \%$ whilst the index yields $4 \%$, the market is assuming that the dividend growth rate of that share will grow, in perpetuity, by $2 \%$ p.a. more than the equivalent on the index. Figure A.2.6.1 shows a 5 -year plot of the dividend rating for three shares.
A.2.7 The graph of the top share shows the dividend rating increasing, so that the difference between the dividend yield and the index is declining, as are the estimates of the long-term growth prospects for that share. The share must be


Figure A.2.6.1. Dividend yield rating for three shares over 5 years.
regarded as dear in the long term. Conversely, the graph of the bottom share reveals that the share is cheap in the long term.
A.2.8 Since the slope of the dividend yield rating is determined by the longterm relative dividend growth prospects, the indicator would be improved by eliminating this further factor from the comparison, so that the indicator becomes the long-term growth prospect for the dividend relative to that of the index. This is, in fact, the factor used by Clarkson in his well known model (J.I.A., 110, 17 and T.F.A., 37, 439). Use of Clarkson's factor, known as the relative price residual, will flatten out the dividend yield relative plots, producing a display not dissimilar to that of the middle graph on the figure.
A.2.9 Whilst the full scale Clarkson model is an ideal criterion, most analysts, in practice, will use the dividend yield relative, which is so much easier to calculate and display. Clearly the share concerned is cheap short term when the graph is at its peak, and dear short term at the trough.
A.2.10 Apart from the dividend yield rating, the figure has another interesting feature, in that the distance between the peaks and the troughs represents the variability of the share, a factor analogous to the variance of Modern Portfolio Theory. (The yield rating variance should be rather smaller than the price variance, as both the market movements and the price changes have been taken out of the factor.)
A.2.11 The yield rating display gives an indication, for any particular share, of
whether it is cheap or dear both short and long term. In addition, it gives an indication of risk, which is clearly at a minimum at the peaks and a maximum at the troughs. At the troughs when the share is dear, the risk is measured by the difference between the trough and the peak (a proxy for the variance). It is only at this unusual position that the variance represents the risk. For the rest of the time, as the indicator moves between the peaks and the troughs, the risk is depicted by the extent of the likely change from the present rating to that pertaining at the peak positions.

## APPENDIX 3

## EXAMPLE PORTFOLIO VALUATIONS AND TRANSACTIONS

Table A.3.1. Valuation at 31.12.90

|  | U.K. Equities | Price at 31.12 .90 p | Market value £ | Estimated income £ | Income yield \% | PER |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 200 | Capital Goods: Other Industrial Materials BTR |  |  |  |  |  |
|  | Wts to Sub for Ord 94/95 | 52 | 104 |  |  |  |
| 3,000 | BTR Ord 25p | 321 | 9,630 | 612 | 6.36 | $9 \cdot 10$ |
| 5,700 | Consumer Goods: Food Retailing |  |  |  |  |  |
|  | Conglomerates |  |  |  |  |  |
| 3,200 | Hanson Ord 25p | 184.5 xd | 5,904 | 444 | 7.52 | $9 \cdot 10$ |
| 4,000 | Other Groups: Miscellaneous BAT Industries Ord 25p | 577 xd | 23,080 | 1,659 | $7 \cdot 19$ | $10 \cdot 00$ |
|  | Electric Utilities |  |  |  |  |  |
| 5,000 | London Electricity |  |  |  |  |  |
|  | Ord 50p KG lnt Cert--100p Pd | 138.5 | 6,925 | 414 | $7 \cdot 13$ | 9.80 |
| 5,000 | Northern Electric |  |  |  |  |  |
|  | Ord 50p RG Int Cert-100p Pd | 147 | 7,350 | 451 | 7.55 | 8.40 |
| 3,100 | Water Authorities |  |  |  |  |  |
|  | Northumbrian Water |  |  |  |  |  |
|  | Ord £1 RG Int Cert-170p Pd | 279 | 8,649 | 469 | $6 \cdot 13$ | $4 \cdot 30$ |
|  | Oil and Gas |  |  |  |  |  |
| 3,500 | British Petroleum Ord 25p | 334 xd | 11,690 | 737 | 6.31 | 10.00 |
|  | Insurance (Life) |  |  |  |  |  |
| 5,000 | Britannic Assur Ord 5p | $646 \cdot 5$ | 32,325 | 1,483 | 4.59 |  |
| 5,300 | Prudential Corp Ord 5p | 196 | 10,388 | 678 | 6.53 | 15.60 |
|  | Insurance (Composite) |  |  |  |  |  |
| 9,200 | Sun Alliance Group Ord 25p | 330 | 30,360 | 1,595 | 5.25 | 12.10 |
| 12,400 | Utd Friendly Group 'B' (Rst Voting) 10p | 263 | 32,612 | 1,529 | $4 \cdot 69$ | 12.70 |
|  | Total |  | 196,516 | 10,561 | 5.37 |  |

Table A.3.2. Valuation at 31.12.91

|  | U.K. Equities | $\begin{gathered} \text { Price at } \\ 31.12 .91 \\ \mathrm{p} \end{gathered}$ | Market value $£$ | Estimated income $£$ | Income yield \% | PER |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 200 | Capital Goods: Other Industrial Materials |  |  |  |  |  |
|  | BTR |  |  |  |  |  |
|  | Wts to Sub for Ord 94/95 | 74 | 148 |  |  |  |
| 3,000 | BTR Ord 25p | 399 | 11,970 | 650 | 5.43 | 13.00 |
| 120 | BTR |  |  |  |  |  |
|  | Wis to Sub for Ord 95/96 | 55 | 66 |  |  |  |
|  | Consumer Goods: Food Manufacturing |  |  |  |  |  |
| 2,000 | Perkins Foods Ord 10p | 143 | 2,860 | 107 | 3.73 | $13 \cdot 60$ |
| 5,700 | Food Retailing Sainsbury (J) | 377 xd | 21,489 | 581 | 2.71 | 16.90 |
| 2,100 | Other Groups: Miscellaneous BAT Industries Ord 25p | 628 xd | 13,188 | 918 | 6.96 | $22 \cdot 30$ |
| 5,000 | Electric Uilities |  |  |  |  |  |
|  | London Electricity |  |  |  |  |  |
|  | Ord 50p RGi Int Cert-170p Pd National Power | 247 | 12,350 | 730 | $6 \cdot 50$ | 8.90 |
| 4,000 |  |  |  |  |  |  |
|  | Ord 50p RG; Int Cert-100p Pd | 144.5 | 5,780 | 259 | $5 \cdot 16$ | $8 \cdot 60$ |
| 5,000 | Northern Electric |  |  |  |  |  |
|  | Ord 50p RGi Int Cert-170p P | 270 | 13,500 | 799 | 6.64 | 8.30 |
| 4,000 | Powergen |  |  |  |  |  |
|  | Ord 50p RG Int Cert-100p Pd | 155.5 | 6,220 | 262 | 4.97 | $9 \cdot 40$ |
| 6,000 | Scottish Power |  |  |  |  |  |
|  | Ord 50p (RG Int Cert 100p) | 102.5 | 6,150 | 307 | 5.06 | 12.90 |
| 6,000 | Scottish Hydro |  |  |  |  |  |
|  | Ord 50p (RG Int Cert 100p) | $104 \cdot 5$ | 6,270 | 304 | $4 \cdot 98$ | 11.30 |
| 5,000 | Telephone Networks |  |  |  |  |  |
|  | British Telecom Ord 25p | 328.5 | 16,425 | 917 | $5 \cdot 58$ | $10 \cdot 20$ |
|  | Water Authorities |  |  |  |  |  |
| 3,100 | Northumbrian Water Ord £1 | 345 xd | 10,695 | 794 | 7.42 | $5 \cdot 10$ |
| 3,000 | Southern Water Ord £1 | 312 xd | 9,360 | 732 | 7.82 | $5 \cdot 80$ |
| 3,500 | Oil and Gas |  |  |  |  |  |
|  | British Petroleum Ord 25p | 293 xd | 10,255 | 784 | 7.65 | $9 \cdot 30$ |
| 3,800 | Financial Group: Insurance (Life)Britannic Assur Ord Sp |  |  |  |  |  |
|  |  | 852.5 | 32,395 | 1,343 | $4 \cdot 14$ | 29.50 |
|  | Insurance (Composite) |  |  |  |  |  |
| 6,000 | Sun Aliance Group Ord 25 p | 287 | 17,220 | 1,140 | 6.62 |  |
| 8,600 |  |  |  |  |  |  |
|  | 'B' (Rst Voting) 10p | 345 | 29,670 | 1,256 | $4 \cdot 23$ | 19.00 |
|  | Total |  | 226,011 | 11,883 | $5 \cdot 26$ |  |


|  | U.K. Equities | $\begin{gathered} \text { Price at } \\ 31.12 .92 \\ \mathrm{p} \end{gathered}$ | Market value $£$ | Estimated income £ | Income yield \% | PER |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Capital Goods: Other Industrial M | erials |  |  |  |  |
| 200 | BTR |  |  |  |  |  |
|  | Wts to Sub for Ord 94/95 | 173 | 346 |  |  |  |
| 3,000 | BTR Ord 25p | 550 | 16,500 | 670 | 4.06 | $22 \cdot 10$ |
| 120 | BTR |  |  |  |  |  |
|  | Wts to Sub for Ord 95/96 | 128 | 154 |  |  |  |
| 120 | BTR |  |  |  |  |  |
|  | Wts to Sub for Ord 97 | 131 | 157 |  |  |  |
| 2,000 | Consumer Goods: Food Retailing Sainsbury (J) Ord 25p | 564 xd | 11,280 | 241 | $2 \cdot 14$ | $22 \cdot 50$ |
| 1,000 | Health and Household Products Wellcome Ord 25p | 967 xd | 9,670 | 173 | 1.79 | $26 \cdot 90$ |
| 1,400 | Other Groups: Miscellaneous BAT Industries Ord 25p | 983 | 13,762 | 681 | 4.95 | 40.80 |
|  | Electric Utilities |  |  |  |  |  |
| 5,000 | London Electricity Ord 50p | 437 xd | 21,850 | 1,160 | $5 \cdot 31$ | 8.50 |
| 4,000 | National Power Ord 50 p | 285 | 11,400 | 501 | $4 \cdot 40$ | 9.80 |
| 5,000 | Northern Electric Ord 50p | 481.5 | 24,075 | 1,287 | $5 \cdot 34$ | 8.10 |
| 4,000 | Powergen 50pd | 285 | 11,400 | 509 | $4 \cdot 47$ | $7 \cdot 10$ |
| 5,000 | Scottish Hydro |  |  |  |  |  |
|  | Ord 50p (RG Int Cert 170p pd) | 260 | 13,000 | 496 | 4.25 | 12.80 |
| 3,000 | Seeboard 50p | 472.5 | 14,175 | 718 | 5.07 | 8.8 |
| 5,000 | Telephone Networks <br> British Telecom Ord 25p | 403.5 xd | 20,175 | 990 | $4 \cdot 91$ | $12 \cdot 10$ |
|  | Water Authorities |  |  |  |  |  |
| 3,100 | Northumbrian Water Ord £1 | $584 \times \mathrm{dd}$ | 18,104 | 889 | 4.91 | 6.80 |
| 3,000 | Southern Water Ord £1 | 476 | 14,280 | 804 | 5.63 | 7.90 |
|  | Oil and Gas |  |  |  |  |  |
| 3,500 | British Petroleum Ord 25p | 248 xd | 8,680 | 392 | $4 \cdot 52$ | 46.00 |
| 3,000 | Financial Group: Insurance (Life) Britannic Assur Ord 5p | 10.995 | 32,985 | 1,224 | 3.71 | 38.00 |
| 8,600 | Insurance (Composite) Utd Friendly Group 'B' (Rst Voting) 10 p | 503 | 43,258 | 1,491 | 3.45 | 24.90 |
|  | Total |  | 285,251 | 12,226 | 4.31 |  |


|  |  | Description $P$ | Purchase/ Sale | Cost proceeds | FTA <br> All-Share Index | Purchase/ (Sale) units | Outstanding units |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Date |  |  |  | £ |  |  |  |
| 1.1.91 | Initial Portfolio |  |  |  |  |  | 190.38 |
| 1.2 .91 | 3,200 | Sun Alliance | S | 10,746 | 1,035.41 | (10.38) | 180.00 |
| 12.3.91 | 4,000 | National Power | P | 4,848 | 1,195.72 | 4.05 | 184.05 |
| 12.3.91 | 4,000 | Powergen | P | 5,011 | 1,195.72 | $4 \cdot 19$ | 188.24 |
| 13.3 .91 | 1,200 | BAT | S | 8,250 | 1,193.82 | (6.91) | 181.33 |
| 13.3.91 | 3,000 | Southern Water | P | 9,124 | 1,193.82 | 7.64 | 188.97 |
| 19.6 .91 | 700 | BAT | S | 4,993 | 1,194.88 | (4.18) | 184.79 |
| 19.6 .91 | 3,900 | Scottish Power | P | 4,528 | 1,194*88 | $3 \cdot 79$ | 188.58 |
| 19.6.91 | 3,900 | Scottish Hydro | P | 4,767 | 1,194.88 | 3.99 | 192.57 |
| 19.6 .91 | 2,200 | Prudential | S | 5,036 | 1,194•88 | (4.21) | 188.36 |
| 19.6 .91 | 1,600 | Prudential | S | 3,663 | 1,194.88 | (3.07) | 185.29 |
| 30.7.91 | Call 3,100 | Northumbrian Water (70p) | p) P | 2,170 | 1,238.75 | 1.75 | 187.04 |
| 30.7 .91 | Call 3,000 | Southern Water (70p) | P | 2,100 | 1,238.75 | 1.70 | 188.74 |
| 14.10.91 | 1,500 | Prudential | S | 3,460 | 1,241.30 | (2.79) | 185.95 |
| 14.10.91 | 1,000 | United Friendly | S | 3,945 | 1,241.30 | (3.18) | 182.77 |
| 23.10 .91 | Call 5,000 | Northern Electric (70p) | P | 3,500 | 1,235.05 | $2 \cdot 83$ | 185.60 |
| 23.10 .91 | Call 5,000 | London Electricity (70p) | P | 3,500 | 1,235.05 | 2.83 | 188.43 |
| 20.11 .91 | 1,200 | Britannic | S | 10,275 | 1,194.77 | (8.60) | 179.83 |
| 20.11.91 | 6,000 | Sun Alliance | S | 18,446 | 1,194.77 | (15.44) | 164.39 |
| 20.11.91 | 2,800 | United Friendly | S | 10,140 | 1,194.77 | (8.49) | 155.90 |
| 20.11 .91 | 3,200 | Hanson | S | 6,299 | 1,194.77 | (5.27) | 150.63 |
| 21.11 .91 | 3,000 | British Telecom | P | 10,634 | 1,190-69 | 8.93 | 159.56 |
| 21.11.91 | 2,100 | Scottish Hydro | P | 2,203 | 1,190.69 | 1.85 | $161 \cdot 41$ |
| 21.11 .91 | 2,100 | Scottish Power | P | 2,160 | 1,190.69 | 1.81 | 163.22 |
| 26.11 .91 | 2,000 | Perkins Foods | P | 3,140 | 1,192.08 | 2.63 | 165.85 |
| 9.12 .91 | 2,000 | British Telecom | P | 6,803 | 1,156.61 | $5 \cdot 88$ | 171.73 |
| 12.12.91 | 6,000 | Sun Alliance | P | 17,666 | 1,164•10 | $15 \cdot 18$ | 186.91 |
|  |  |  | Total |  | Sells: | 72.52 |  |
|  |  |  |  |  | Buys: | 69.05 | 186.91 |

Units at $1.1 .91: 196,516 / 1,032 \cdot 25=190 \cdot 38$

| Description |  |  | Purchase/ Sale | Cost proceeds | FTA <br> All-Share Index | Purchase/ (Sale) units | Outstanding units |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Date |  |  |  | $£$ |  |  |  |
| 1.1.92 | Initial Portfolio |  |  |  | 1,187.70 |  | 186.69 |
| $\begin{aligned} & 3.1 .92 \\ & 5.1 .92 \end{aligned}$ | 6,000 | Sun Alliance | S | 18,028 | 1,193.57 | (15.10) | 171.59 |
|  | Calls | National Power and Power Gen | P | 6,000 | 1,209.68 | 4.96 | 176.55 |
| 7.2.92 | 4,000 | Sun Alliance | P | 10,725 | 1,229.38 | 8.72 | 185.27 |
| 4.3.92 | 4,000 | Sun Alliance | S | 11,078 | 1,228.42 | (9.02) | 176.25 |
| 4.3.92 | 4,000 | Scottish Hydro | P | 4,359 | 1,228.42 | 3.55 | 179.80 |
| 5.3.92 | Calls | Scottish Hydro and Scottish Power | P | 11,200 | 1,247.22 | 8.98 | 188.78 |
| 24.3 .92 | 800 | Britannic | S | 6,501 | 1,180.40 | (5.51) | 183.27 |
| 24.3.92 | 5,000 | Royal | P | 9,103 | 1,180.40 | 7.71 | 190.98 |
| 26.3.92 | 5,000 | Royal | S | 9,350 | 1,185.63 | (7.89) | 183.09 |
| 13.7 .92 | 2,000 | Sainsbury | S | 8,826 | 1,187.85 | (7.43) | 175.66 |
| 13.7.92 | 5,000 | Scottish Hydro | S | 9,590 | 1,187.85 | (8.07) | 167.59 |
| 13.7.92 | 700 | BAT | S | 5,310 | 1,187.85 | (4.47) | $163 \cdot 12$ |
| 15.9.92 | 3,000 | Seeboard | P | 12,010 | 1,118.69 | 10.74 | 173.86 |
| 15.9.92 | 2,000 | Perkins Food | S | 1,050 | 1,118.69 | (0.94) | 172.92 |
| 15.9 .92 | 1,700 | Sainsbury | S | 7,182 | 1,118.69 | (6.42) | 166.50 |
| 15.9.92 | 6,000 | Scottish Power | S | 10,674 | 1,118.69 | (9.54) | 156.96 |
| 15.9.92 | Calls | London Electric and Northern Electric | P | 7,000 | 1,118.69 | $6 \cdot 25$ | 163.21 |
| 17.11.92 | 1,000 | Wellcome | P | 10,006 | 1,272.58 | 7.86 | 171.07 |
|  |  |  | Total |  | Sells: | 74.39 |  |
|  |  |  |  |  | Buys: | 58.77 | $-15.62$ |

Units at 1.1.92: $221,731 / 1,187 \cdot 70=186 \cdot 69$

ABSTRACT OF THE DISCUSSION

Mr R. C. Ross (opening the discussion): The authors have put forward some helpful suggestions on detailed measurement of performance, and explained how inferences and information can be drawn from those performance statistics.

Although it is not the paper's main focus, it is interesting to learn how Mr Plymen, in particular, manages portfolios. We rarely get an insight into the thought process and philosophy that gocs into managing portfolios, which is clearly related to the performance measurement methodology.

The detailed methodology for monitoring a portfolio of stocks goes a little further than just monitoring; it is very much part of the management process. The analysis is done on particular securities, and the measurement process helps identify the trigger points which will cause a profit to be realised and so to track the progression of the portfolio towards its target. The methodology is probably a little too detailed for immediate presentation to trustees. The trustees may feel satisfied that a rigorous reporting procedure is in place, and a skilled performance measurer could draw out the important information and present a summary of the key information.

In Section 1, I agree with the suggestion that measuring performance merely by comparing a rate of return on assets against the return on peer funds with similar objectives falls short of achieving the main objectives of a performance measurement exercise. The prime focus of performance measurement should be the measurement of performance against the objective which has been set for the fund, i.e. its benchmark. Nowadays it is very easy to buy the benchmark from an index fund manager; it can be bought very cheaply and with a high degree of certainty. The burden of proof lies with active managers to show that they can add return over and above their fees.

The measurement of skill is difficult, but it needs to be addressed. If I manage a portfolio for a year and achieve an outperformance against the benchmark of $1 \%$, it is not clear whether that is skill or whether I was lucky. If I achieve an outperformance of perhaps $3 \%$ p.a. over a five-year period, I would be more confident and more credible in asserting that this was the result of skill rather than luck. We cannot be absolutely certain at any point in the future that it was skill that led to good investment results. All we can do is make some probability statement: the probability that this level of outperformance was the result of luck alone is less than $5 \%$, but we cannot be absolutely certain.

It is important to identify skill in retrospect, because it is part of accounting for the management of the portfolio. It is also very important going forward. There is much evidence that looking at the historical performance of portfolios in isolation is of no value in identifying future skill. In Appendix 1 the authors draw our attention to some of the qualitative aspects which might contribute to better decisions going forward. One omission from that appendix is comment on the value of monitoring the people and the way that they make their investment decisions on a continuous basis. Continuous monitoring of people and the investment process, plus performance numbers, analysis of the portfolios, price/earnings ratios and dividend yields, etc. as mentioned in the paper, give an excellent platform for going forward. It is always interesting to look at price/earnings ratios and dividend yields, not only by comparison with the index, but also by comparison with other managers with a similar benchmark. "I am a big bet manager; my portfolio has a dividend yield of six compared to the market index of five." Is that really a big bet? To answer, we need to know what other managers are doing.

The authors define risk in $\S 3.1$ as "that the individual investments selected in the aggregate perform badly, and achieve investment returns lower than expected". Thinking more generally, I view risk as "the probability of failing to achieve your objectives". That is completely consistent with the authors' view. I agree that the disciples, if not the preachers, of modern portfolio theory have confused risk with volatility and variability. The authors make the important point in $\S 3.7$ that high variance can be an opportunity as much as a risk. In looking at the investment of long-term funds there are two aspects of risk that are important. One is the textbook, or MPT, volatility risk. The other is that returns in the long term are not high enough. The trade-off between needing to achieve higher longterm returns and short-term volatility is probably the key consideration in setting a long-term
investment strategy. This subject was covered in some detail by Clarkson in his paper, 'The Measurement of Investment Risk' (J.I.A., 116, 127).
The authors suggest that the increased use of computer analysis should make it easier to identify shares which are cheap and liable to outperform the market. That is undoubtedly true. Of course it is a two-edged sword, in that computers are available to all the participants in the market. It is possible that this will remove inefficiencies and opportunities. Does advancing technology actually make asset management more difficult or less profitable?

Having endorsed the authors' definition of risk, I have some reservations about the measurement of risk. Paragraphs 3.8, 4.1 and 6.2 suggest that the authors are measuring risk in retrospect. Risk is to be measured "as the performance relative to an appropriate index", and they suggest that "The method of measuring portfolio performance . . . shows clearly the actual risk . . . a year in arrear". To me, risk is a forward-looking concept related to uncertainty. There can be no risk in the past, since the past is certain. There is limited value in analysing past returns to measure risk. This highlights a common pitfall in the use of performance data; the quality, or skilfulness, of a decision cannot always be judged by measuring the outcome. Let me use an analogy. Suppose 1 believe that there is a risk that my house might burn down next year, and I decide to pay an insurance premium to protect myself against the financial consequences of that event. If at the end of the year my house has not burnt down, my net financial position is that I have lost my insurance premium. That outcome does not mean that the risk did not exist, or that I made a wrong decision which lacked skill at the beginning of the year. A parallel situation to this is often seen in investment. A decision cannot always be judged by its outcome. With that thought in mind, it would help the reader if, in $\$ 3.9$ and 4.0 , the authors had distinguished between looking back at actual under or over performance and looking forward to expected under or over performance. The two need to be distinguished.

Strictly speaking, virtually all returns that we read about are wrong. So-called time-weighted rates of return are actually money-weighted approximations to the true time-weighted rate of return. True time-weighting requires a portfolio valuation every time there is a cash flow; that it is made not just when there is a purchase or sale, but every time a dividend is received by the portfolio or even when a tax reclaim is re-invested. That is clearly impractical, and the challenge of performance measurement is to trade off the cost of collecting, verifying and processing additional data against the benefit of reducing the degree of approximation. Additional computing capacity may shift the balance of this trade off over time, but the key requirement is to be aware of the circumstances in which these approximations can go wrong. Most of the approximations in the current system on the market are fairly robust. Some others have been taken out in this methodology. I question whether the additional data are actually yielding very much in the way of benefit.
Given that the authors are trying to improve the accuracy of performance measurement, I am surprised by their treatment of income. The unitisation of capital and income together is not too challenging. The unit trust industry seems to manage this without too much difficulty. In the measurement of a U.K. equity portfolio, the availability of the ex-dividend adjustment sits very well with the authors' technique. A drawback to the authors' technique is that the calculated fund return is not directly comparable with that of other funds, although the performance relative could be used for this purpose.

If I were to enhance existing performance measurement techniques, it would be by doing more calculations on attribution of returns. The authors make a number of statements secking to explain why the portfolio has under or overperformed. It is possible to do calculations to make these statements more precise and to support their assertions. For example, in §8.2, we know that Water was the best-performing sector, but we do not know whether the manager was under- or overweighted in this sector and what the impact of this decision was in terms of contribution to the total return. We only know that, of the two stocks selected within the Water sector, one performed almost in line with the sector and the other underperformed by about $18 \%$. So, the impact of stock selection in the Water sector was negative.

Having said that performance attribution would generally be helpful, I think that, for this particular U.K. equity portfolio, it would not be particularly illuminating, because it does not appear that this is the way in which Mr Plymen manages his portfolio. I think he is a fundamental 'bottom
up' stock picker. He does not appear to look at industrial sectors before moving down to particular stocks.

In § 8.4, it is stated that $10 \%$ of the portfolio has, in effect, become an index tracking operation. It is not clear to me why a sub-portfolio which is $60 \%$ in BT and $40 \%$ in BP should actually track the performance of the FTA All-Share Index.

The distinction made in Section 10 between short-term, long-term and disaster risk as components of embedded risk is interesting. There is quite a lot of evidence, certainly at the asset class level, that there is noise in security prices, that the volatility of markets in the short term is greater than could really be justified by changes in the fundamentals-new information coming into the market-which the authors term long-term risk. There is an excellent analysis of this subject in a paper entitled appropriately 'Noise' by Fischer Black, which appeared in The Journal of Finance in 1986.

The concept of disaster risk is intuitively sensible, but difficult to assess in advance. The authors suggest that the top 50 shares by market capitalisation are virtually immune from disaster risk. I would just note that the highest rankings by market capitalisation achieved by Maxwell Communications and Polly Peck were 71 and 61 respectively; so perhaps 50 is safe, but not by very much. Although it is less true of Maxwell Communications, I am aware of many highly respected investment houses who were unable to identify in advance the disaster risk that was embedded in Polly Peck.

Appendix 2 refers to relative strength measures of cheapness and dearness. Many academics have studied the extent to which past movements in a share's price may provide valuable information as to the future direction of that share price.

Mr P. F. Rains: The authors provide a clear exposition of how traditional fund management is carried out in practice. The use of capital units is a simple alternative to the time-weighted rate of return as a method of performance monitoring. I wondered, however, if it suffered from the deficiency of being affected by the timing of cash flows into and out of the fund. For example, if a fund manager had two funds, both of which outperformed the index for the first half of the period and then underperformed for the second half, and one of the funds had a cash flow in the middle of the period, then this would depress the recorded performance of that fund when compared with the other.

The assessments of skill and risk are strongly connected by the authors, and they show how a fund manager's ability to outperform can reduce risk. Unfortunately, as the authors admit, the outperformance produced by the methods adopted is not significant in a statistical sense, and their efficacy can be disputed on other grounds. Therefore we cannot be sure that the risk of the fund is being reduced in the way they describe.

A portfolio with only 17 stocks and a heavy sector bias seems inconsistent with a stated performance target of $1 \%$ to $3 \%$ outperformance. It is not necessary to be a disciple of modern portfolio theory to believe that there is some value in looking at how a portfolio would have performed historically as a guide to how it might track an index in the future. If this was done for the portfolio-or one similar to it-it would be seen that the performance was likely to vary from the index by considerably more than the $1 \%$ to $3 \%$ objective-notwithstanding the actual outcome in 1991.

The more fundamental point-as mentioned by the authors-is that the price formation process is not constant over time. This is because of changes to economies, economic management, the characteristics of companies and the make-up of investors. Therefore we cannot rely entirely on the past to predict the future. This applies to the validity of management approaches as much as to risk assessment. It is probably best to consider risk in a number of ways, of which historic simulation is likely to be one and the stock and sector load differences another. For similar reasons it is appropriate to calculate risk assuming that the fund manager does not add value. The calculations can then be repeated for an expected outperformance by the fund manager-which, if downside semi-variance is used, can be undertaken within the modern portfolio theory framework-as suggested in the original paper on this subject by Markowitz in 1952 ('Portfolio Selection', Journal of Finance, VII, 77).

Mr R. S. Clarkson, F.F.A.: As the opener pointed out, the authors give an eminently sensible downside definition of risk as the possibility of lower than expected investment returns and dismiss as
irrelevant what I would describe as the 'Beta bandwagon'- the single factor modern portfolio theory measure of risk seized by academics and business schools, including the unthinking use of variance of expected returns as the measure of risk for portfolio management purposes.

I agree with the opener that risk in terms of variability is more an opportunity than a disadvantage. Investment models showing short-term cheapness and dearness along the lines of Figure A.2.6.1 can definitely add value. The opener asked whether all other investors will have similar models. Those investors who have a good model in place before the competition can, in my experience, do very well. Professor Gordon Pepper produced a brilliant gilts model many years ago. My non-linear model built in a few variations that made a great deal of money for the policyholders of the company that I used to work for. Technology has moved on, and the anomalies in the gilts market are not there to the same extent. However, opportunities for short-term timing in the equity market are still there, and models that produce graphs of the type shown in Figure A.2.6.1 can add considerable value.

In the debate 'This House Believes that the Contribution of Actuaries to Investment could be Enhanced by the Work of Financial Economists', held here in March 1993 (J.I.A. 120, 393), I said that I regarded the Beta bandwagon as the Stone Age risk vehicle of the financial economists. I consider that its wheels are falling off one by one:
(1) In an article in the New' York Times of 18 February 1992, Eugene Fama, who is widely regarded as the founder of the efficient market hypothesis, said that Beta as the sole variable explaining the return on shares is dead. There was an interesting, but not very convincing, damage limitation exercise by Fischer Black, the co-author with Scholes of the paper on an option pricing model in the Fall 1993 issue of The Journal of Portfolio Management. The only comment I would make is this: given his commercial interests, he would say that, wouldn't he!
(2) Professor Markowitz now uses the downside risk measure of semi-variance rather than the symmetric risk measure of variance for practical investment management. Mr Rains suggested that Markowitz used semi-variance from the beginning, but there is no reference to it in his 1987 book 'Mean-Variance Analysis in Portfolio Choice and Capital Markets'. It is only over the past few years that he has embraced the downside measure of risk.
(3) Peter Bernstein, the Consulting Editor of The Journal of Portfolio Management, also in the Fall 1993 issue, has drawn attention to the unsuitability of conventional definitions of risk in what I see as a very perceptive editorial article entitled, 'The Time Dimension of Risk'.
The authors peremptorily dismiss the efficient market hypothesis in §3.7, and I do not think that many investment managers will disagree with them. I disagree with the opener as to what extent the analysis system set out in Section 4 complicates the analysis of investment performance. I regard the computational system described in that section as very straightforward, and I first used it many years ago for manual computational systems. Recently, when we were designing comprehensive computerised systems, using the unitised method of allocation we avoided the various approximations that tend to become ingrained in performance analysis, such as having to assume that purchases and sales are made mid-month.

Perhaps the most important message that I saw in the paper for professional investors is the numerical picture in Table 8.1. The divergence of sector returns over periods as short as one year is so extreme that if, like one of tonight's authors, you can position your portfolio very strongly towards the top performing sectors, the potential outperformance over the market index is very considerable indeed. However, in my experience this is not how the professional investment game is normally played. It may be great fun for the engineering analyst at a stockbroking firm or an institutional investor to play a relatively safe and harmless financial version of musical chairs by trying to outperform the engineering indices by the very small margins that are sufficient to ensure his or her continued employment at a very comfortable salary, but might this financial brainpower not be of more use, both to the financial well-being of the clients who own the funds and also to the commercial interests of the analyst's employers, if it was directed towards determining whether any engineering shares should be held in the portfolio at all?

Section 9 extends the system to a much broader portfolio, and I was particularly interested in the contrast between the quite outstanding long-term investment skills identified in $\S 9.15$, and the somewhat disappointing short-term trading performance identified in §9.16. In the context of this
excellently performing portfolio, the short-term trading loss is part of the cost of throwing out the potential poor performers to make sure of keeping as many of the long-term winners as possible, and I would not draw general conclusions for this particular fund. However, one of the most difficult questions facing the senior management of an investment operation is the extent to which you should allow portfolio managers to express short-term, as opposed to long-term, investment views in the structure of their portfolios. It is so difficult even to identify apparently predictable long-term trends where many random elements tend to cancel out, that we should not dissipate too much scarce investment resource trying to predict short-term movements where essentially random elements tend to overwhelm our powers of short-term prediction. If we concentrate on using our predictive skills to look after the long-term performance, the risk inherent in the short-term performance should look after itself.

Mr D. J. Parsons: I remember being involved in performance measurement of pension scheme portfolios over 20 years ago. I worked out quarterly time-weighted returns on a mechanical adding machine and I agree with the authors that such measurement was as good as could be achieved using the technology of the time. We now have much better technology. Existing performance measurers have also evolved over the last 20 years and may become obsolete in a market where performance is measured by reference to specific benchmarks. They have to evolve to survive.

The system proposed by the authors is positive evolution, and can clearly identify the manager's abilities. It is made feasible as a standard approach by modern technology and indices. It is simple in concept so that the investment managers themselves can work out the results and explain them to their clients and to their bosses. Even pension scheme trustees will understand and welcome this sort of advance.

Mr N. D. Freethy: I found the titlc of this paper rather misleading. Those of us who have ostensibly represented the viewpoint of the scheme actuary on investment panels-in my case, getting on for 25 years-have, from time to time, assisted with analysing and changing investment managers with varying degrees of success. When I saw the title of the paper, I thought I would at last be told how to increase my strike ratio. The main conclusion, however, seems to be to entrust one's portfolio to the management of Mr Plymen.

Indeed, the authors focus on achieving a more efficient way of analysing performance statistics than the present methods. The increasing power of computers, allied to more frequent computations of necessary valuations by systems such as Datastream and the much-heralded new FTA indices, will make instant conversions into the related index (in the manner favoured by the authors) increasingly easier and more cost-effective to implement.

Whereas I find the paper long on method and example, it seems shorter on interpretation of results. In §7.5.1, the authors appear to ascribe success to the managers selecting companies with "the maximum expected yield and with the best prospects of high continuing dividend growth". I wonder how they arrived at that conclusion. They might equally have ascribed outperformance to a policy of holding shares with high dividend yields and low price/earnings ratios because, whatever the reason, an inferior manager might have adopted the same approach, but got it wrong and have underperformed. Yet the reasons ascribed to underperformance would, in the eyes of the authors, presumably be the same. He just chose the wrong shares. What are missing are the steps which led the authors from the figures to their deductions.

By the authors' own admission, in $\S 10.10$, the strategy adopted for the U.S. fund is very different to that of the U.K. manager. I have always been rather suspicious of the philosophy of "running profits and cutting losses". It depends on the size of the profit (a function of the stage in the cycle at which the share was bought), and whether the share showing a loss does so because the fundamentals have deteriorated or whether, if the fundamentals have not altered, the share is even more cheap relatively with all the more reason to hold it . What was the reason, for example, behind the failure to sell as outlined in § 6.5? The U.S. manager's approach seems to be a "quick on onc's fect approach" which is much more demanding. I also find that, when I meet it, it is much more difficult to understand or to go on trusting whether the manager will always get it right.

Either method can succeed-the long-term value method on the one hand, the getting in and out
quickly method on the other. I do not know whether the analysis in the paper gets us much farther than to say that, because the performance has been good in the past, it will necessarily continue that way in the future.

The statement in § 10.3 that the long-term risk of a share is measured by its proportional departure from index weighting assumes, in effect, that the index itself is riskless. It certainly appears not to have been on 17 December 1987, and the paper would be more complete if the authors extended their methods to include all the various asset types and the allocation between them. That is an even more valid way of assessing the quality of a manager. At any time, for example, a manager can, in theory, liquidate the whole portfolio and stay in cash.

The success stories analysed in detail by the authors took place at a time when markets were generally rising. It will be interesting to see how they fare when markets turn round, and maybe the authors can tell us a little about what has happened so far in 1993.

The ultimate usefulness of this sort of work and analysis is to see what it tells us about the success (or lack of it) of the incumbent manager. If the latter applies, how do we decide when the point has arrived to make a change, and who do you choose instead? My firm publishes an annual survey of all investment management houses which covers, not only past performance, but other relevant aspects, including an analysis of the style and philosophy which leads to the performance. Other consulting firms are also adding to their databases continually, and this makes it difficult for an investment house whose philosophy is woolly (initial success in attracting business may very easily bring about a change in approach, particularly for a newcomer seeking to break into the market), or who is dependent on one or more individuals (and I do not deny individuals are often more important than the house itself), or whose methods are not wholly sound, over time not to be found out.

What we are left with is a relative handful of well-established, soundly-based investment houses whose methods have stood the test of time, and the all-important issuc is whether they can continue to stand the test of time as success in attracting more clients often plants the seeds of decay.

Mr J. M. MacLeod: This paper comes at a fortunate time. The Goode report on pension law reform was published just over a month ago. In its consideration of funding for discontinuance, the report puts forward the following as its 28th Recommendation: "The Government should give serious consideration to the issue of a new type of security which could provide more appropriate backing for schemes' indexed liabilities". The main body of the report specifies the characteristic of this new type of security. Both income and capital should be linked to the RPI. Income should be deferred for a period and should then be payable from some specified date in the future to some final redemption date. Various forms of stock will therefore be issued, though it is not stated on what scale or on what terms the Government should be prepared to issue them. The implication is, however, that a higher proportion of a discontinued scheme's assets would be invested in them than in the case of an ongoing scheme.

The funding requirements of schemes would be even better served by a slightly different type of new security; namely, one whose value was not linked to the RPI, but was based on the investment performance of some notional average U.K. pension fund. This security would never attract a dividend. It would remain a zero coupon stock. Its value would increase, or maybe sometimes decrease, by the average net rate of investment return experienced by U.K. exempt approved pension schemes as a whole, as measured by the authors of this paper and their ilk. It would be at that value that schemes could, within laid down limits, purchase it from or pass it back to the Revenue. The stock would, therefore, have no specific repayment dates as such. It would exist in only one, single form, not a variety of forms; and its price would always be objectively determined, not subject to the forces of supply and demand, nor to a jobber's turn. The stock would not be tradeable on the Stock Exchange, and could be held only by pension funds-in itself a protection against fraud.

Issuance of stock of this form, and not stock linked to the RPI, might, moreover, save some future government from the nightmare scenario in which, as in Russia today, prices rocket, and salaries, wages and investments collapse. It would surely be inequitable if, in the lead up to that scenario, members of on-going pension schemes saw the value of their prospective benefits disappear, while members of discontinued schemes saw the value of their prospective benefits bolstered up by Government guarantee. I believe therefore that, from all points of view, this fund-related stock would
be a better instrument than that described by Goode for achieving the required funding objectives of pension schemes. Such a fund-related security might also accelerate the flow of cash between the Revenue and pension schemes to the advantage of the Revenue, and with a totally neutral effect on the finances of pension schemes.

My suggestion is that exempt approved pension schemes should continue to operate exactly as at present, except that each scheme should be required to pass over $15 \%$ of all contributions that it receives to the Revenue in exchange for a corresponding amount of the fund-related stock. When benefits come to be paid, stock with a then current value of $15 \%$ of those benefits should be redeemed. At both contribution payment time and benefit payment time an exchange of cash for stock or stock for cash will take place on current market terms, and no one could object to that. It would leave the scheme and its members exactly where they would be under the present tax regime, but would give the Chancellor $15 \%$ of all incoming scheme contributions-that is to say, some $£ 3 \mathrm{bn}$ or $£ 4 \mathrm{bn}$ per year throughout the immediate future; that is money which the Revenue would not otherwise receive until pension funds as a whole started to contract, and money which would save the Chancellor of the Exchequer from having to raise that amount of money now from increased taxes. If the pensions industry does not want taxation, then perhaps it would do well to bring about the stock purchase route. Until now, although convinced of the strength of the argument for its introduction, I wondered whether the techniques existed for providing the pricing mechanism necessary to operate such a stock in practice. This paper gives me confidence that such techniques are, indeed, firmly in place.

Mr G. M. Lindey, F.F.A.: I agree, in principle, that for a continuing fund volatility as a measure of risk is an irrelevance. However, more funds are becoming mature and, if a fund is going to be subject to outflows over a period which is unpredictable, then volatility is clearly a very important risk. The Goode Committee has suggested a minimum solvency level, which could mean that, if a fund is heavily exposed to equities and there is a sustained and major downturn in the equity market, the fund would be subject to serious difficulties. The magnitude of the difficulties is a matter of hot debate within the actuarial profession at the present time. The estimates of the difficulty range from minimal to very large indeed. If things change, if the assets are, more importantly, linked to the liabilities that are going to be calculated in the new fashion, then it is foolish to ignore it. In future, asset liability studies are going to be absolutely fundamental to everything we do.

The new type of security suggested by the Goode Committec has resulted in discussions with the authorities, who are looking with great interest at legislation which would enable the type of security to which Goode is referring to be introduced.

I agree with the opener that most of the Plymen portfolio looks much like a 'bottom up' portfolio, a stock picker's portfolio. Yet Section 8 seems to suggest that there is an element of 'bottom down-ness' in the industry selections. I have my doubts. Work done by some of my colleagues demonstrates very clearly that in times of high volatility it is much easier to add performance to an equity portfolio than in times of low volatility, and that it is possible to add value from sector selection. However, analysing portfolios, it has proved impossible for the overwhelming majority of managers to do that on a consistent basis, and the extent to which managers do add value by sector selection would appear, statistically, to have been a matter of luck rather than skill. One reason is that reliance on individual sector analysts to make decisions on a sector gives the problem of analyst bias. There may be a perfectly good engineering analyst and a perfectly good banking analyst, who are very good in each case of selecting the best and the worst stocks within their sector, but if one of them is permanently bullish and the other one is permanently bearish, then you are going to have a bias towards one and against the other all the time.

On the other hand, a portfolio strategist may have a grand vision, but he will certainly lack the detailed information of all the individual analysts and he may not be able to overcome his own bias. There is also a timing problem. The strategist may very well perceive, for example, that interest rates are going to rise dramatically, and you may position your portfolio to take advantage of that. The trouble is that you may already be priced into the securities in question.

Mr T. G. Arthur: 1 am opposed to Mr MacLeod's suggestion of a new Government stock, because the fastest and simplest way to totalitarianism is for the Government to underwrite all financial risks.

I sympathise with quite a lot of the paper. I agree with the opener in his slightly more sophisticated look at risk, and I like his example about the house insurance premium, which is very interesting.

The question of the internal rate of return versus time-weighted rate of return is not just about cash flows. Of two funds with identical cash flows, one could have a smaller time-weighted rate of return and a bigger money-weighted rate of return. I do not think that either measure is very much good. I would prefer qualitative methods. If it is necessary to rely on quantitative methods for assessing investment managers' skill, it is essential to have some form of analysis and attribution. The actuarial profession has been fond of deriding property specialists for having inadequate statistical information, but it is the branch of investment practitioners which has universally separated out capital and income ever since I can remember.

The paradox, when looking at past statistics to assess skill, is that virtually any sensible method will do if performance is measured over a long enough period, but that does not help, hecause circumstances change over that period. In the short term not one of the measures seems to work properly, because there is too much interplay between luck and other factors.

Good performance can come from either the anticipated income stream over the long run, or from the market coming round to a manager's point of view quite quickly. It is impossible to know when that is going to happen. It might take days; it might take months; it might take years. That may be why a financial director measures the performance of his company in the shorter run by looking, not at dividends paid plus increases in his company's share price, but at earnings per share. There may be a lesson for us there. Perhaps we should go back to looking at the increase in earnings per share to see how well we have performed in buying those investments.

MrS. J. Breban: In $\S 7.4$ the authors say that the key to success during the year was choosing stocks where the dividends performed well. They justify this by showing industries where dividends had increased and industries where they had not. That proves that the key to success was choosing the industries and not necessarily choosing companies with increasing dividends.

In §7.10, the authors state that the holding of Royal had negative risk because it was at its usual percentage low compared to the calendar year high. I imagine that Polly Peck and a number of other stocks reached this position and still managed to go on further down. Paragraph 9.17 contradicts $\$ 7.10$ by saying that if shares fall relative to the index then they should be sold. Paragraph 10.4 suggests the same.

In § 10.2 the authors write about a system which claims to produce a return of the index plus $4 \%$ with no long-term risk. However, there must be some long-term risk to achieve the return of index plus $4 \%$.

I agree that a prospective view of risk is more helpful than a retrospective one. A number of index managers already offer a consensus fund similar to that proposed by Mr MacLeod.

Mr J. M. MacLeod: In reply to Mr Arthur's point as it stands it is partially valid, but it is covered by the fact that the stock I described would only be issued by, and returned to, the Revenue within prescribed limits. I agree that, if the Government could issuc an unlimited amount of this stock, and $100 \%$ of the liabilities of a pension fund could be exchanged for it, then that would be a totalitarian situation. However, if you take, say, $15 \%$ of contributions that come in, and allow the stock then to be redeemed only to the extent of $15 \%$ of the benefits, then there would be no strain on the Treasury at benefit payment time, because the tax that would be levied on the benefits under the PAYE system could be expected to be more than the $15 \%$ that would then be redeemed.

Mr G. V. Smith: I work with an investment management company and use a number of the techniques highlighted in the paper. We find this approach very useful when analysing the performance of a fund at slock level. Fund managers find it very helpful when explaining the performance to trustees, since it focuses them on particular problem stocks. The approach also demonstrates that, if the fund manager had done nothing during the quarter or the year, then he might have been better off. It is very useful to use the stock level analysis in conjunction with the standard performance attribution analysis.

One enhancement which we find useful is to take into account the weighting of the index in each

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stock that is held within the fund as well as taking account of stocks in the index which were not held by the fund. For example, assume that the fund holds $4 \%$ in British Telecom and $4 \%$ in a small company, and both outperform the index by $10 \%$. The fund's weighting in British Telecom may, for the purpose of illustration, be in line with the index, and this stock's contribution to relative performance, therefore, would be zero. On the other hand, the fund manager has actually taken a strong position in the small company and added value in that way. It is useful to look at relative, rather than actual, weightings multiplied by relative performance at stock level.

The analysis should include stocks not held. For example, if one did not hold HSBC Holdings, then this may, in itself, have led to an underperformance of $1 \%$ against the index, say. If a number of large companies were bid for during the period, then the fund manager may have underperformed simply because he did not hold these bid candidates, and the trustees would probably be relatively comfortable with this reason for underperformance.

The authors say that their approach can be readily applied using computer programs and accessing the required data. This is not true in practice. Analysing the performance of stocks sold during the period post the sale is difficult, as the administrative database may not have any price information on the stock, particularly if the entire holding was sold. An external source of the prices as at the end of the period has to be found and adjusted for any stock splits or rights issues. This can obviously be very time consuming, particularly in European markets, where there can be a number of capital reorganisations, and so on. If one is automating the analysis for, say, 200 funds, then ideally one needs an external source giving such information for the entire market about 1,600 stocks in the U.K. equity market alone. Finally, if one is analysing fixed-interest portfolios, one needs to take into account the ex-dividend dates, particularly when they are close to a quarter end, as this can distort the contribution from individual stocks considerably.

Mr M. G. White: The investment management industry as a whole adds very little value, in part because there are commercial pressures towards avoiding short-term underperformance with insufficient reward for long-term outperformance. However, if an investment manager believes that he can perform well in the long term, why not adjust his reward to reflect his confidence in himself? Out would go fees based on a percentage of the fund value; in would come fees based on long-term outperformance over a benchmark. The fees could be, say, $25 \%$ of the outperformance. The manager would then have to have sufficient capital to go unrewarded for a long time, and maybe to go unrewarded altogether. To avoid a manager taking punts with a number of portfolios in the hope that at least some of them would produce high fees, the manager would be required to invest some of his own money in the funds. Again, the investment manager would need to be very well capitalised. Many investors, especially retail investors, are interested in long-term performance, and such a product could be very attractive in the marketplace, but who has enough confidence to offer it?

Buying and selling shares is a negative sum game. Investment managers could make a positive contribution if they took a more active interest in the management of companics in which they are holders. Being an active investor in this sense would mean becoming a more passive investor in the sense of dealing less frequently-a proprietor as opposed to a punter.

Mr A. F. Wilson: I am a pensions practitioner, although I have a small amount of experience in asset liability modeling, and 1 am a user of performance measurement services.

There are currently more than $£ 400$ bn in pension funds. I estimate that well over half of that is in respect of current pensioners dividing, fairly reasonably, one third each between pensions which are fully protected against inflation, pensions which have LPI already in place, and others which are either unguaranteed as regards increase, or guaranteed at a lesser level. To try to match these liabilities with suitable assets, we ought to have in place $£ 70$ bn of index-linked stock and $£ 70$ bn of LPI-linked stock-quite irrespective of whether we did anything for the active members at all.

If a new stock is introduced, I suggest that it ought to be one linked to LPI rather than RPI; in other words, RPI with a maximum of $5 \%$ p.a. As a country we cannot be sure that in the long term we will always sec an increasing standard of living. If we find at any time that we have a decreasing standard of living, is it right that that should be visited only on the active population and not on the pensioner population?

Many pension funds are beginning to realise that the utility functions of surpluses and deficits in pension funds have changed; that surpluses are not always such good things for companies. If it is going to be a long time before any return can be made to a company other than by way of a contribution holiday, many schemes will say, "We understand the risk/return reward of investment in equities, but can we fully justify going for delayed reward, given the downside risks, especially if we have many pensioners to be paid?" Some schemes are, therefore, beginning to think in terms of switching from a $90 \%$ real $/ 10 \%$ gilt model, to one which is much more in suitable gilts-say $50 / 50$. How do you decide when to switch? If you leave it up to the investment manager, how do you tell how successful he has been? Has he made the switch at the right time? Has he taken the right risks in not switching until a bit later? This is an aspect of portfolio performance measurement which we have not yet addressed. It is one which is going to become increasingly important in the future.

Mr P. J. Lee: I am not sure what extra value the additional level of detail in the paper would bring to performance measurement. If, for example, Mr Plymen's portfolio had been a subscriber to either the CAPS or the WM service over the past two years, it would equally well have shown how good his performance was relative to the All-Share Index. Concentrating on the sales and purchases does not bring very much extra value. For example, the decision to hold a security is an active decision in the same way as to purchase it. Transaction costs can mean it is better to hold a portfolio than to sell, unless shares get particularly over-valued.

If I had followed the authors' method and held only one share during 1992, the one share in their portfolio which outperformed all the rest, then my performance, as shown by this method, would have been even better than theirs. On the other hand, no one would hire me as an investment manager because, whatever measure of risk you use, it would have been astronomical.

Variance has many defects, but it has one major advantage over semi-variance. If you have two portfolios and you know the variance of each one, you can combine them into a third portfolio and calculate its variance. I do not know how you can calculate the semi-variance. For that practical reason semi-variance, although a nice concept, is not likely to be used very much in future.

Mr J. P. McCaughan (closing the discussion): It is not the prime objective of the paper, but the working through of the progress of two particular portfolios, especially the U.K. equity portfolio which is shown in more detail, will give insights into portfolio management to those who are not normally involved in this area of activity. In using the paper in this way, however, the investment criteria used by the manager of yield and dividend growth, as described in §7.5.1 and Appendix 2, need to be emphasised. Whether skill has really been demonstrated by the excellent two-year results for the fund is not clear. This may simply have been a favourable period for the investment approach used. A yield and growth approach of this sort would do very well during a period of falling interest rates.

The analysis of transactions might give some further suggestions, but must be inconclusive. Investment skill needs staying power. To test a fund manager and a fund management approach needs a longer run of data. Similarly, to test the usefulness or otherwise of this approach to assessing a manager's skill would require its application to a number of funds over a more extended period. The authors have made a promising initial contribution; but further work is necessary.

Performance measurement is an area of much current research, and live topics include the search for persistent patterns in performance data, performance attribution, study of portfolio characteristics, and the linking of performance to these characteristics using style analysis. This debate is active, not only in the U.K. and in the U.S.A., but also in Japan and Continental Europe, where development of performance measurement has been relatively recent. The authors have made a contribution to the debate, in particular in the analysis of transactions in Section 5, and the distribution of results within portfolios described in Section 9. Further work within the actuarial profession could benefit greatly from a greater awareness of the work in this area being done in the wider financial world.

The analysis presented, separating income and capital, should be particularly appropriate for taxed funds where there is no league table and, as yet, no clear recognised practice. However, there are

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problems, apart from differential tax on income and capital, for example, the treatment of deferred tax.

In $\S 1.2$ and in Section 4, the authors are too negative about current methods of performance measurement. The model fund approach, described in the 1972 paper of the Performance Measurement Working Party of the (then) Society of Investment Analysts, is similar in many respects to that used by the authors. In the 1972 paper, however, the model fund construction is then used to estimate time-weighted returns as an alternative to the linked internal returns method. Investigation along these lines to relate the method of the paper to existing practice might be helpful. In any case, I am concerned about the total concentration on measuring returns relative to indices. This can lead to problems with multi-asset portfolios and the effect of asset allocation. That was described in some detail in the 1972 paper just referred to. An index is an attempt-sometimes imperfect-to describe the returns available in the market. Peer group analysis should have a place since, by definition, it shows the returns which have, in practice, been captured in an asset class. Performance measurement in a more complete sense, relating investment performance to the broader objectives of an institution, in terms, for example, of liabilities and funding assumptions, is a future area of research and particularly appropriate for the actuarial profession.

It is in the related areas of risk and market efficiency that I have most reservations. Paragraph 3.7 over-simplifies the theories of market efficiency, which were relatively unstructured until Fama's work was published in 1965 and 1970. Fama gave definitions of different levels of market efficiency, which have proved very useful to researchers, in using statistical tests to describe and better understand the workings of capital markets. With certain conditions, a market was defined to be semi-strong efficient if prices always fully reflected publicly available information. This is the most durable of Fama's different levels, and tests for such efficiency have been a fruitful area for research. The definition of efliciency closest to that in $\S 3.7$ was formulated by Jensen in 1978. He suggested: "A market is efficient with respect to an information set if it is impossible to make economic profits by trading on the basis of that information set." The idea that, for some purposes, it is useful to describe markets as efficient has led to a much better understanding of the behaviour of stock markets, and the authors are wrong to dismiss it out of hand.

Also, the criticism of variance analysis seems misplaced. Ex-ante the probability of underperformance is clearly related to semi-variance, and, as has already been noted, analysis of variance is only a simple way of attempting to describe behaviour of variances in combination.

The idea of embedded risk in the paper needs clearer definition and measurement if it is to be useful. The debate between Fama and Black, as described by Mr Clarkson, shows the value of MPT and the value of Beta as a framework for discussion which can lead to better understanding of markets. Models are only descriptions of part of reality. None of them can claim to be a full description of reality, which is much richer and more complex than any model.

The MacLeod security, which has been described in some detail, seems to be a simple synthetic which could be produced by the investment bankers if there is a demand. It does not need the Government to issue it.

The lack of links to other research in finance are not unique to this paper, but have, in my view, weakened much actuarial work over the last two decades or so. Developments which have been made in, for example, risk analysis, performance measurement, market efficiency, definition of shortfall risk, market modelling and option pricing, have widespread potential applications in actuarial work. Conversely, the practical experience of actuaries could strengthen the efforts of those involved in finance theory and lead to a better understanding of capital markets and financial arrangements generally.

The President (Mr L. J. Martin): The paper before us, which, among other things, aims to measure a fund manager's skill at beating an index, provides an intriguing approach to judge an investment manager's performance-a qualitative rather than a quantitative one. In principle, the method seems relatively straightforward and likely to be understood, as has been said, by trustecs and those to whom fund managers report, as well as by the managers who are to be judged.

John Holbrook presented a paper on 'Investment Performance of Pension Funds' in 1977 (J.I.A., 104, 15). Investment measurement of pension funds had been going on for a few years before that
time, but that was the major paper which gave an impetus to, and encouraged, the now widespread practice of investment performance measurement as we know it.

It will be interesting to see the extent to which the system proposed in the paper for measuring a manager's skill will also catch on in popularity. Wearing a trustee's hat, I can see that it would be most useful, whereas wearing a manager's hat, I can see that I might have mixed feelings!

It has been good to have had an investment paper in this present session. I am sure that we would all agree, as Mr McCaughlan has said, that our profession must strive to be, and continue to be, at the forefront of research in this particular subject, and that we shall work to apply the theory in practice. We need to encourage both research and practical application.

This is a paper of direct practical use, and we have had a wide ranging discussion. I know that you would wish to join me now in congratulating the three authors and in thanking them for the work that they have done in presenting their paper to us.

MrS. J. Green (replying): I agree with the opener on almost all his points. One point was taken up by Mr Breban, who pointed out that we did try to measure risk prospectively. Most measures of risk, in fact all that I know of put forward by the financial economists, the MPT experts, are retrospective. Michael Payne, in the discussion of Holbrook's paper in 1977, said "Portfolio risk theory is devoted to measuring risk retrospectively, which may be too late." I have yet to see any prospective measurement of risk.

Mr Rains referred to the fact that, with only 17 shares in a portfolio, to set a target to beat the index by $1 \%-3 \%$ was probably rather modest. The variability is too great, so that it is right that one should have held more shares in the portfolio. The trouble was finding portfolios which could be published. They have to have outperformed before the managers would let us publish them.

I agree with Mr Clarkson. Professor Markowitz recently said to Mr Clarkson and Mr Plymen, following their paper at the Faculty (T.F.A., 41, 631), at which he was present, that he now realised that the use of semi-variance was correct, and not the variance that he had gone for in his original 1952 thesis and his 1959 book. It is very interesting that all the financial economists for the past 30 years did not spot this; but a couple of actuaries, writing a paper which was presented here (JIA. 115, 631) and later at the Faculty, actually made the great man change his mind.

I welcome the contributions of Mr Parsons, Mr Freethy and Mr Wilson. Tonight we were aiming at the consultants as much as anyone else. We tried to analyse the two portfolios in different ways. Given the right tool, it is up to the consultants to use that tool to try to analyse the portfolio to bring out the best in the managers. I agree with most of Mr Freethy's remarks. Where I do not agree with him is that he seemed to imply that we said that because a performance had been good, it would carry on being good. That is not what we intended to say.

I agree with Mr Macleod that the Treasury looks as if it is casting its greedy eyes at pension fund assets. Politicians and civil servants, with their index-linked and unfunded arrangements, have always been willing to hypothecate-and that is another word for 'steal'-private assets against which they propose to issue future promises. There is nothing new in this. If pension funds are going to be raided, and I feel they are, it is right that actuaries should give their views as to how best this can be done without damaging too seriously the interests either of the members or of the employers. There should be a forum somewhere for the actuarial profession to do this.

I welcome Mr Smith's remarks as a practitioner, and the fact that his firm seems to be using a technique similar to this. The techniques which we described are not totally dissimilar to techniques which John Brew used at Grieveson Grant years ago, which I introduced to the British Airways pension fund over 20 years ago. Neither Brew nor I can claim any originality. We both based ours on a system which Mobil were using in the U.S.A., as described in the Journal of Financial Analysis in about 1968. One variation is described in Eadie's 1973 paper. When you invest in any particular share then you notionally invest in the sector index at the same time, and that gives you an alternative measure.

I like the idea of performance fees. A company offered this service some years ago and had only one taker. In those days, perhaps, it was too novel.

At a recent seminar at the Royal Society, Professor Robert Merton of Harvard University, who is one of the gurus of MPT, gave what he described as the fundamental theorem of the efficient market
theory; the value of a share is the present value of the future dividend flow. That, to me, is what the actuarial profession has been saying for a 100 years or more.

We said that we are not happy with time-weighted rates of returns and we expected to provoke somebody from the performance measurement houses to argue with us, but it appears that there is none with whom to argue. Holbrook and Eadie, together with a number of others, have already substantially criticised the time-weighted rate of return. Anything which we can do to substitute a more practical basis for portfolio measurement would be of use to the profession as a whole.

## WRITTEN CONTRIBUTION

The authors subsequently wrote: Some speakers suggested that the favourable results of some of the tables were not statistically significant, and could therefore be due to chance or luck rather than to the skill of the operator. This comment certainly applies to Table 5.5 , which would have shown an overall loss for the year had it not been for a fortuitous profit on a sale. However, Table 7.1 shows that the opening portfolio reveals a profit of $£ 58,636$, some $21 \%$ of the equivalent index value of $£ 279,115$. In this case the manager must surely be given credit for having built up such a profitable portfolio based on skilled purchases in earlier years.

Under the system demonstrated in the paper, purchases and sales are analysed over an average period of 6 months. In particular, the performance of purchases and sales made in the second half of the calendar year is so affected by 'noise' and expenses as to be useless as an indicator of investment skill. For future applications we propose to alter the system. For the calendar year 1992 the movements will be frozen at 30 June, so that the changes made in the last 6 months are ignored. Purchases and sales used for analysis will be those between 30 June 91 and 30 June 92, giving an average performance period of 12 months (the same period as that used for the old portfolio). With this improved procedure, the results of the purchases for the 12 months straddling 31 December 91 will include part of the substantial profits from the 1992 opening portfolio, demonstrating the manager's selection skill. In practice, the skill of the manager in respect of individual share transactions is readily revealed just by obtaining a relative strength chart of a share for 5 years and marking on it the purchases and sales at the appropriate dates. For example, Figure 10.1 shows the performance of Sainsbury shares relative to the FTA All-Share Index. The Sainsbury holdings of the U.K. fund were bought in 1989 with the price index relative around 0.24 . Sales were made during the second half of 1992 with a relative factor of about 0.37 or 0.38 , just below the peak value of about 0.42. The under-performance which started in December 1992 continued during most of 1993. On 28 January 1994 the price was 393, the index 1727 and the price relative $0 \cdot 23$. For this share the manager's skill rating is surely $100 \%$, as the purchase was made on favourable terms in 1989, the shares were held whilst the price was doing well and the temptation to take a profit was resisted. Finally, the shares were sold just short of the peak relative value, anticipating the price collapse during 1993. For the whole portfolio the assessment scheme checks the manager's purchasing skill, checks the performance of the main portfolio and studies the performance of the sales over the following year. At each of the phases, the selection, the maintenance and the selling, the manager's performance is checked and ranked.

With the traditional performance measurement systems, the manager's performance is usually watched for 5 years before any decision is made about a replacement. With the new system, however, a 2-year study is all that is required to rank the manager's performance and to reveal any weakness in his techniques.

At the Institute Seminar on 'Actuarial Approaches to Financial Management', held on 16 November 1993, Professor Markowitz introduced the Daiwa portfolio optimisation system, which uses modern portfolio theory to obtain the maximum return for a given level of risk in the Japanese market. His original market model incorporated returns based on historic prices using the variance as a measure of risk. He now uses a most sophisticated measure of return based on elaborate regression analysis of a large number of factors. For the risk element he now uses the semi-variance rather than the variance. Consequently his original portfolio theory of 1959 must now be regarded as a Stone Age technique with no practical applications.

The closer criticised "the total concentration on measuring returns relative to indices". This
concentration is quite deliberate, because indices are, in fact, the actuarial contribution to investment analysis, investment performance and investment selection. Evaluation relative to an index can be conducted with a number of factors: the price, the dividend, the earnings, etc. In contrast, evaluation relative to a single factor of return is a much less precise operation. The closer refers to developments, presumably by financial economists, in risk analysis, performance measurement, market efficiency, financial risk, market modelling and option pricing. We suspect that many of these developments are based on old fashioned mean variance analysis techniques, which are inferior in practical operation to the actuarial processes based on close index comparisons with several factors recommended in this paper.

