INDEXING LONG-TERM FINANCIAL CONTRACTS

BY A. D. WILKIE, M.A., F.F.A., F.I.A.

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INTRODUCTION

This paper has two functions: first, in part 1, to present briefly the results of some recent investigations into the behaviour of a price index (in the United Kingdom) in order to gain some insight into the possible future progress of inflation; secondly, in parts 2–4, to present the arguments in favour of the linking to a price index of financial instruments, in particular government stocks, life assurance contracts and pension fund benefits. Part 1 is heavily statistical, and those who prefer the controversial material can go straight to part 2, noting only the conclusion to part 1, viz.: that it is not easy to forecast inflation over any lengthy period. Parts 2–4 are controversial, and I expect will still be topical when the paper is presented. I make no pretence to be impartial; I am convinced that widespread index-linking of long-term contracts would have a beneficial effect on the conduct of our financial affairs. It is up to those who disagree with me to put their case in the discussion; but I hope my supporters will express their views too.

1. INFLATION

1.1. The data

My first objective was to investigate the behaviour of prices, as represented by some suitable price index, and to do this I used the same techniques of time series analysis as had been used by the Maturity Guarantees Working Party for their Report, published in J.I.A. 107, 101. Appendix F of that report summarizes the models that may be used and explains the terminology. Note in particular that the notation \((p, d, q)\) represents the following model:

\[
z'_t = \alpha_1 z'_{t-1} + \alpha_2 z'_{t-2} + \ldots + \alpha_p z'_{t-p} + \epsilon_t + \beta_1 \epsilon_{t-1} + \beta_2 \epsilon_{t-2} + \ldots + \beta_q \epsilon_{t-q}
\]

where

\[
z'_t = z_t - \mu,
\]

\[
z_t = \nabla^d x_t,
\]

and \(x_t\), \(t = 1, 2, \ldots, n\) is the original series, or a transformation thereof.

This is a condensed version of a fuller description of my investigations which has been deposited in the Institute Library. The fuller version includes the data and details of all the models investigated.

The data I used were taken from Mitchell (1962) and Mitchell and Jones (1971) and are based on a number of different price index series, spliced end-to-end, and
covering the period from 1661 to 1980. In recent years I used the Retail Prices Index for June in each year. I put them on to a common base of 100 in 1661, and I show the values in Figures 1–4, with a vertical logarithmic scale.

1.2. Preliminary considerations

Before considering the data it is desirable to consider how one might expect a priori a price index to behave. Changes in prices occur reasonably gradually, so annual values are not likely to be very far apart. An index value has no significance in itself, so the scale is arbitrary. If the general level of prices has changed markedly for any reason there is no special reason for it to return to its previous level, so the series will probably not fluctuate about any fixed mean. At different levels of the index proportionate changes rather than absolute changes have a comparable significance. An index of prices is necessarily positive; the experience of other countries shows that there is no limit to the number of zeros that can be added to the end of it in a hyperinflation.

These considerations suggest, first, that we should take the logarithm of the price as the variable to study (thus changing the range to be infinite in both directions, and giving equal proportionate changes equal significance) and secondly that we should expect to take differences at least once before finding a stationary series to analyse. In the \((p, d, q)\) terminology for models we should expect \(d\), the number of times we difference the values, to be 1 or even 2, but not 0.

1.3. A first look at the data

Since I have taken a very long series, covering 320 years, we might also imagine

![Figure 1. Price index from 1661 to 1740.](chart)
Indexing Long-term Financial Contracts

Figure 2. Price index from 1740 to 1820.

Figure 3. Price index from 1820 to 1900.
that economic circumstances may have changed in that time, and so different models, or at least different parameter values, might apply over different subsections of the series. When we first look at the whole series in Figures 1–4 we see in fact that it was remarkably stable for the first 250 years or so, from 1661 to say 1914. During that period the index drifted slowly and irregularly down from its starting point of 100 in 1661 to a low of 61·1 in 1744; then slowly and irregularly up to a high of 170·7 in 1813; then again slowly and irregularly down to a low of 50·9 in 1896; there was then a fairly steady rise to a peak of 168·3 in 1920, a fall to 94·6 in 1933 and an almost unbroken rise to 1259·8 in 1980.

The largest price rises and falls in single years were:

<table>
<thead>
<tr>
<th>Year(s)</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1914–75</td>
<td>+26·1%</td>
</tr>
<tr>
<td>1914–15</td>
<td>+23·0%</td>
</tr>
<tr>
<td>1799–1800</td>
<td>+21·2%</td>
</tr>
<tr>
<td>1979–80</td>
<td>+21·0%</td>
</tr>
<tr>
<td>1916–17</td>
<td>+20·5%</td>
</tr>
<tr>
<td>1852–53</td>
<td>+19·1%</td>
</tr>
<tr>
<td>1711–12</td>
<td>−25·2%</td>
</tr>
<tr>
<td>1801–02</td>
<td>21·5%</td>
</tr>
<tr>
<td>1921–22</td>
<td>−19·0%</td>
</tr>
<tr>
<td>1847–48</td>
<td>−15·5%</td>
</tr>
<tr>
<td>1813–14</td>
<td>−15·5%</td>
</tr>
<tr>
<td>1820–21</td>
<td>−13·6%</td>
</tr>
</tbody>
</table>

Substantial price changes have thus not been unique to recent years.

1.4. The periods studied

The remarkable feature, for me at least, was the great stability over the first 250 years. This suggested that it was worth studying this period on its own. I chose to
go up to 1914, giving 254 annual observations. I shall refer to this as period B, giving the letter A to the whole period of 320 observations. It did not seem worth splitting up this long period into shorter ones. The general appearance of the series looked homogeneous. We are really interested in the future, and the more recent past was worth considering separately.

To represent the more recent past I chose, first, the 85 observations from 1896 (the all-time low) to 1980 (the latest high). During these 84 years the price index rose 24.8-fold, at an annual rate of 3.9%; the price index fell in only 18 of these years. I call this period C. I also looked at the last 35 observations, from 1946 to 1980, on the grounds that this post-war period, which I shall call D, may be thought a better guide to the future than more distant past data. I am not wholly convinced by this idea though others may be attracted to it. I want to use this analysis to obtain forecast intervals for prices (and hence inflation) over long periods ahead, and I believe it a good ad hoc rule that one should not forecast more than \( n \) years ahead on the basis of \( 2n \) years of past history. It will be seen that periods C and D give not vastly different results.

1.5. Period B, 1661–1914

I consider first period B, viz. the 254 values from 1661 to 1914. During this period the values appear reasonably stationary. The mean value of the natural logarithm of the price index was 4.4054 (= log 81.9), and the standard deviation of the values was 0.2373 (equivalent to +26.8% to –21.1%). The autocorrelation function showed high values, falling exponentially, a pattern typical either of a (1, 0, 0) model, i.e. \( x_t = \alpha_1 x_{t-1} + \varepsilon_t \) with \( \alpha_1 \) near 1, or of a (0, 1, 0) model, i.e. \( x_t - x_{t-1} = \mu + \varepsilon_t \), where \( \alpha_1 \) of the first model is taken as exactly 1. Differencing once is probably desirable.

The 253 differences of the (logged) series have a mean of –0.0015 and a standard deviation of 0.0665. The first ten autocorrelation coefficients are:

\[
0.11 \quad -0.17 \quad -0.21 \quad -0.10 \quad 0.14 \quad 0.01 \quad -0.02 \quad 0.00 \quad 0.02 \quad -0.00.
\]

The second, third and fifth of these are significantly different from zero. (The observed autocorrelation coefficients of a series of \( N \) independent identically normally distributed variables are distributed with mean zero and standard deviation \( 1/\sqrt{N}; 1/\sqrt{253} = 0.063 \).) The maximum likelihood estimate \( \hat{\alpha}_1 \) for a (1, 0, 0) model is 0.9637, with a residual \( \hat{\varepsilon} \) of 0.658, a little lower than that for a pure random walk (0, 1, 0) model. But, as for that model, several of the first five autocorrelation coefficients are large compared with their standard deviation of 0.063, and higher order models are indicated.

These large autocorrelation coefficients are not eliminated till we reach a (4, 0, 0) model. The best fit is reached with a (6, 0, 0) model. There seems no good reason to try models of a higher order than this.

When we turn to the \( (p, 1, 0) \) models we find that a model of order (3, 1, 0) is needed to eliminate the relatively high autocorrelation coefficients, and indeed
the best fit is reached, just, with a (6, 1, 0) model, though a (5, 1, 0) model is very close. We should now observe that a (p, 1, 0) model can be expanded to correspond to a (p+1, 0, 0) model, with a constraint on the parameters. If we relax this constraint we may find that the optimum parameter values for the (p+1, 0, 0) model are very little changed, i.e. the models are really quite similar. This is indeed the case. The (3, 1, 0) and (4, 0, 0) models are similar, as are the (5, 1, 0) and (6, 0, 0).

1.6. The prospect in 1914

In 1914 one would have felt confident either that prices had an absolute mean level, perhaps related to gold, or that if a non-stationary process was involved it had either a small negative mean (μ for most of the (p, 1, 0) models was −0.0016) or the mean might well have been zero (the standard error of μ was typically 0.0040). One could rest assured that extreme price rises or falls over a long period were unlikely, though in the year ahead prices might rise or fall easily by 6½% (μ = 0.0639 for the (3, 1, 0) model) but would probably be within 13% of their present levels (exp (1.96 × 0.0639) = 1.133; exp (−1.96 × 0.0639) = 0.882). Price stability in the long run was more sure than in the short run.

Over the 20 years following 1914 the forecaster would have seen the forecast intervals of his model repeatedly breached. The percentage price rises in six successive years were 23.0%, 18.7%, 20.5%, 15.3%, 5.9% and 15.8%, with five out of six rises well exceeding two standard deviations. The falls in 1920–23, changes of −9.2%, −19.0% and −4.9% included another one extreme value. But by 1930 the index value would actually have been within his 1914 funnel of doubt for the (3, 1, 0) model, and from 1931 to 1936 would have been below the original 1661 starting value.

The alternatives of (p, 0, 0) and (p, 1, 1, 0) models may well represent two possible attitudes to prices that were prevalent in the period up to 1936, viz. that prices were inherently stable, and after some disturbance were likely to move back to their ‘normal’ level, or alternatively that while prices might not revert after a disturbance the expected rate of inflation was essentially zero. These attitudes, formed over many years of personal experience, are ingrained in the thinking of those brought up during that period, and are institutionalized in many of our business practices, in our legal, accounting, banking, taxation, insurance and pension fund systems.

1.7. Period A, 1661–1980

From 1933 to 1980 prices as shown by these indices have fallen in only 2 years, 1942–43 (−5.0%) and 1946–47 (−2.0%). The change in every other of these 46 years has been positive. This has made it steadily harder to maintain either of the attitudes described above. If we apply the same suite of models we find that the (p, 0, 0) models are unstable, so that the expected logarithm of the price grows exponentially. The expected rate of inflation over the next 40 years is around 18% p.a. A higher order model, such as (6, 0, 0) provides the best fit.
The \((p, 1, 0)\) series of models are more stable, but a higher order model such as \((5, 1, 0)\) is again needed to eliminate the high autocorrelation coefficients. Again this is similar to the \((6, 0, 0)\) model.

The differences in the parameters are, however, enough to make the forecast funnel of doubt for the \((6, 0, 0)\) model much wider than for the \((5, 1, 0)\) one. Further, the explosive structure of the model produces a forecast interval for inflation over 40 years that is nowhere near that for the \((5, 1, 0)\) model. The upper \(97\frac{1}{2}\%\) limit, expected value and lower \(2\frac{1}{2}\%\) limit for this 40-year inflation are \(22.0\%, 16.1\%\) and \(10.5\%\) for the \((6, 0, 0)\) model, as compared with \(5.1\%, 1.5\%\) and \(-1.9\%\) for the \((5, 1, 0)\) model. The choice of model becomes critical.

While the \((6, 0, 0)\) model is unstable, and therefore an unattractive long-term model, the \((5, 1, 0)\) model has its own disadvantage: in recent years it has seemed to fit increasingly less well. Over the last 20 years (i.e. 1959–60 to 1979–80) the residual errors have been positive 18 times and negative only twice, and the mean residual error has been \(-0.05\), much higher than might reasonably be expected. The forecast rates of inflation for the next 5 years are \(8.2\%, 4.9\%, 2.8\%, 3.0\%\) and \(4.9\%)\), rates that some might hope for, but that many would feel unrealistically low. Perhaps the model, or the parameters of the model, would be better judged by looking at a shorter period than the 320 years of period A.


I turn now to period C, the 85 years from 1896 to 1980. Figures 3 and 4 show that prices have been on a general upwards trend during this period, having risen 24.8-fold at an average annual compound rate of \(3.9\%\). Taking differences at least once is appropriate. The mean of first differences of the logarithm of the index is \(0.0382\) with a standard deviation of \(0.0685\); the first few autocorrelation coefficients are high, viz.: \(0.57, 0.35, 0.31, 0.18, 0.12\), indicating either that an autoregressive model \((p, 1, 0)\) is appropriate, or that we should take second differences. The graph of first differences, shown in Figure 5, also shows something of an upwards trend, so possibly even first differences are not stable.

The mean of the 83 second differences is \(0.0020\) and the standard deviation is \(0.0617\); there are two fairly large autocorrelation coefficients, at lags 1 and 2, both of \(-0.22\); this suggests that it is worth trying both autoregressive \((p, 2, 0)\) and moving average \((0, 2, q)\) models, or even a mixed one.

The models based on second differences imply that the inflation rate itself (i.e. the first difference) is unstable, and may wander in a random walk fashion, with the steps being independent of the present level of inflation (though not necessarily being independent of recent steps); there is thus no normal level of inflation. The forecast expected values for the logarithms of prices will show an underlying second-degree curve unless the mean second difference is taken as zero; and the forecast intervals will probably be much wider than for lower difference models.

Detailed investigation showed that any one of several models seemed to fit the data adequately. We can compare them below:
Figure 5. Change per cent in price index from 1896–97 to 1979–80.

The range of results is almost overwhelming. The upper $97\frac{1}{2}\%$ limit of the forecast interval ranges from 58.0% p.a. inflation, at which prices grow $8.94 \times 10^7$-fold in 40 years, to 9.3% at which they grow only 34.5-fold. The lower $2\frac{1}{2}\%$ limit of the forecast interval ranges from 18.1% p.a. at which prices grow 773-fold to $-7.9\%$ at which they fall to only $3.8\%$ of their present level.
The (1, 1, 0) model probably comes closest to the conventional wisdom of the 1950s and 1960s about inflation, that a modest rate of about 4% a year is to be expected, and that the range of possible outcomes is not excessively large. This was the period of Keynesian economic policies and of the 'cult of the equity', when a small reverse yield gap appeared, but faith in fixed interest borrowing had not wholly disappeared, as witnessed by many issues of company loan stocks at around a 7–9% coupon. Inflation helped company profits in £ terms, but inflation was not so extreme that true inflation accounting was really necessary, nor explicit indexation of any monetary amounts.


The experience of the 1970s, however, has disturbed even these ideas. Some personal memories are not all that long, and the market perhaps operates in terms of a more recent history than the last 85 years. I therefore turn to period D, the 35 years from 1946 to 1980, which has seen a very steady upward rise in prices, by 9·2-fold or 6·7% p.a. I considered the same range of models as for period C. Again, any one of several might fit, and the forecast intervals have a wide range. They are compared below:

<table>
<thead>
<tr>
<th>Model:</th>
<th>(2, 0, 0)</th>
<th>(1, 1, 0)</th>
<th>(3, 2, 0)</th>
<th>(0, 2, 1)</th>
<th>(1, 2, 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual standard deviation ( \hat{\sigma} )</td>
<td>-0.391</td>
<td>-0.443</td>
<td>-0.414</td>
<td>-0.420</td>
<td>-0.416</td>
</tr>
<tr>
<td>40-year forecast</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Upper 97½% limit</td>
<td>269·0</td>
<td>12·0</td>
<td>43·7</td>
<td>38·6</td>
<td>36·6</td>
</tr>
<tr>
<td>Expected</td>
<td>219·3</td>
<td>7·7</td>
<td>25·5</td>
<td>24·8</td>
<td>24·9</td>
</tr>
<tr>
<td>Lower 2½% limit</td>
<td>176·2</td>
<td>3·6</td>
<td>9·5</td>
<td>12·4</td>
<td>14·3</td>
</tr>
<tr>
<td>Forecasts for next 5 years</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>1980–81</td>
<td>20·5</td>
<td>16·1</td>
<td>18·7</td>
<td>16·4</td>
<td>17·3</td>
</tr>
<tr>
<td>1981–82</td>
<td>21·6</td>
<td>12·9</td>
<td>14·8</td>
<td>16·8</td>
<td>16·9</td>
</tr>
<tr>
<td>1982–83</td>
<td>23·3</td>
<td>10·9</td>
<td>15·6</td>
<td>17·2</td>
<td>17·1</td>
</tr>
<tr>
<td>1983–84</td>
<td>25·3</td>
<td>9·6</td>
<td>18·9</td>
<td>17·6</td>
<td>17·5</td>
</tr>
<tr>
<td>1984–85</td>
<td>27·5</td>
<td>8·7</td>
<td>19·2</td>
<td>18·1</td>
<td>17·9</td>
</tr>
</tbody>
</table>

It is interesting to note that the residual standard deviation is lower in period D than in the earlier periods; the inflation rate has been higher than before, but also has been less variable.

The model with the lowest residual standard deviation is again the unstable (2, 0, 0) model, where the forecast interval for prices in 40 years' time is from 6·1 \( \times 10^{23} \)-fold to 5·6 \( \times 10^{18} \)-fold. Under this model hyperinflation is almost certain, though I know of no real instance where a hyperinflation lasted so long or so steadily as these forecasts would indicate. Actual hyperinflations, such as in Germany in 1923, have been of quite short duration, such as a few months, but of
extreme intensity. But perhaps Brazil is on such a course; I do not have available price indices for other economies for long enough periods for similar analyses to be made.

The (1, 1, 0) model, however, probably still represents conventional wisdom, with the values of the parameters updated. The forecasts for the next 5 years represent what might be taken as a realistic political target, and the expected forecast inflation of 7.7% over 40 years is comparable with the usual actuarial and capital market assumptions about inflation. But it is much the most optimistic of the models shown; and its residual standard deviation is the highest (at 0.0443). The other models deserve consideration too.

1.10. Conclusion

The conclusion of this preliminary investigation is simple: no single time series model obviously describes the progress of prices over a long period. Whatever may have been their apparent stability up to 1914, the experience of this century, and especially of recent years, makes the uncertainty about the future extremely large. Rather than seek for better ways of forecasting the future, it is better to accept the uncertainty and plan in the context of an unpredictable inflation rate.

Statistical analysis, of course, is not the only way to approach the forecasting of inflation. Many econometric methods give forecasts for inflation for 1 or 2 years ahead with quite possibly a higher degree of accuracy than any of the models I have used. But short-term forecasters seldom give forecast intervals, and seldom indicate the observed root mean square error of their past forecasts. Nor do they, so far as I am aware, attempt to give either point or interval forecasts for middle to longer periods ahead, i.e. 10–40 years; or at least, any forecasts given have perhaps no more validity than one’s own individual guesstimate.

2. INDEX-LINKING OF FINANCIAL INSTRUMENTS

2.1. Inflation—its benefits and problems

The investigations in part 1 of this paper have shown what wise men knew already, that we cannot forecast what the rate of inflation will be over a long period ahead; the range of possibilities is extremely wide, and the effect of compounding makes the range of possible values for a price index in many years’ time almost unimaginably great. Rather than run away from this uncertainty, we must face it and devise ways of running our businesses that allow appropriately for it. Neither the casting of horoscopes nor the study of actuarial life tables is of much assistance in knowing when to book a funeral undertaker’s services for one’s self. But the use of life tables allows life offices to provide individuals with some financial compensation for the dangers of dying too soon or of living too long. We have learnt to treat a large number of lives as if it were a collective with mortality rates as a whole known almost for certain, even though we do not know which members of the group will die each year. Insurance companies perform
this service of spreading risks among individuals, both for life and casualty insurance. Inflation is not an insurable risk.

The trouble with inflation is that what I might call its first order effects are unimportant, or even beneficial. If all incomes and all prices rise in the same proportion then, apart from new numbers appearing on the price tags and pay slips, business continues as before; the real economy is unaffected. Indeed inflation provides a way of reconciling conflicting demands for higher incomes from different groups in society. If group A insists on a 30\% pay increase, it may be fairest to let all others have 30\% too, so that A’s demands for a higher share of the total cake are not satisfied and relative incomes remain unchanged.

It is the second order effects of inflation that cause the trouble. Neither incomes nor prices change in equal proportions; when the overall rate of change is high some prices or incomes surge ahead, others lag behind, just as a body of men when marching can keep ranks, but when they break into a run their order becomes ragged and is then lost. When relative prices are uncertain the efficient allocation of resources is impeded. So there is pressure from those groups in society responsible for planning the use of resources—businesses and government departments—to reduce inflation. When some cry ‘faster, faster’, and others shout ‘slow down’, our smart contingent falls into confusion.

2.2. Long-term arrangements

This makes it especially difficult for those who have made arrangements for long periods ahead. Inflation higher than expected helps borrowers and harms lenders. We therefore find borrowers and lenders shouting in different ways, and those who play several roles speaking with double tongues. The government, as one of the largest borrowers in the business, has a duty to taxpayers, who will foot the bill, not to allow inflation to fall too fast or too low. But it has a wider duty to the whole economy to attempt to restrain inflation within acceptable limits. The present government treats the control of inflation as its major priority. So far it has had mixed success, as the inflation rates over successive 6 months show: from April 1979 to October 1979 the RPI rose by 10·0\% (21·0\% annually); from October 1979 to April 1980 the RPI rose by 10·7\% (22·5\% annually); from April 1980 to October 1980 the RPI rose by 4·3\% (8·7\% annually). The rate of inflation is falling; but for how long will this last? And will it fall to a low enough level for it to be possible to ignore the effects of inflation on long-term contracts? I do not know.

If we knew what the rate of inflation over a suitably long period ahead was going to be we could make explicit allowance for it when arranging a long-term contract such as the issue or purchase of a fixed interest loan stock. Alternatively, if we were satisfied that the expected rate of inflation was near zero and the possible range of future outcomes was narrow, we could ignore inflation in fixing the terms of such a contract. But when inflation over a long period will possibly be high and is certainly uncertain then long-term fixed money contracts cease to be acceptable either to borrowers or to lenders.
2.3. Nominal and real rates of interest

If inflation is at a regular rate of \( i \) per annum, then a nominal rate of interest of \( c \) corresponds roughly to a real rate of interest \( r \) of \( c - i \). Strictly \((1 + c) = (1 + i)(1 + r)\) giving \( c = i + r + ir; r = (c - i)/(1 + i); i = (c - r)/(1 + r)\). Thus, if a loan is issued at an annual coupon of 13\% and inflation is at an even 10\% over the period of the contract, then the real yield will be roughly 3\% (or more exactly 2.7\%); if we assume half-yearly interest payments, then the nominal yield is 13.4\% and the real yield becomes 3.1\%). The so-called ‘interest’ payment becomes largely repayment of the real capital, and in real terms the loan is repaid much more quickly than it is in money terms.

2.4. An example

Exact calculations are also possible if the rate of inflation is precisely known over some fixed period. As an example I use a 20-year stock, issued at par, with a coupon of 13\% payable, for simplicity, annually. I take the expected forecast inflation from mid-1980 according to period D, model (1, 1, 0), i.e.:

\[
\log P_t = \log P_{t-1} + 0.0681 + 0.6609 (\log P_{t-1} - \log P_{t-2} - 0.0681).
\]

This is a model that plausibly represents the market’s thinking, though it is clearly ‘optimistic’ compared with other and better fitting models.

The relative price index (1980 = 100) and expected inflation rates are shown below:

<table>
<thead>
<tr>
<th>Price index</th>
<th>Inflation in previous year (%)</th>
<th>Price index</th>
<th>Inflation in previous year (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>116.1</td>
<td>1991</td>
<td>267.8</td>
</tr>
<tr>
<td>1982</td>
<td>131.1</td>
<td>1992</td>
<td>286.9</td>
</tr>
<tr>
<td>1983</td>
<td>145.4</td>
<td>1993</td>
<td>307.3</td>
</tr>
<tr>
<td>1984</td>
<td>159.3</td>
<td>1994</td>
<td>329.1</td>
</tr>
<tr>
<td>1985</td>
<td>173.1</td>
<td>1995</td>
<td>352.4</td>
</tr>
<tr>
<td>1986</td>
<td>187.3</td>
<td>1996</td>
<td>377.3</td>
</tr>
<tr>
<td>1987</td>
<td>201.8</td>
<td>1997</td>
<td>403.9</td>
</tr>
<tr>
<td>1988</td>
<td>217.0</td>
<td>1998</td>
<td>432.4</td>
</tr>
<tr>
<td>1989</td>
<td>233.0</td>
<td>1999</td>
<td>462.9</td>
</tr>
<tr>
<td>1990</td>
<td>249.9</td>
<td>2000</td>
<td>495.5</td>
</tr>
</tbody>
</table>

If inflation were exactly as shown the real rate of interest on the stock would be 3.1\%, which I think many would intuitively feel to be a fair level of real interest for such a stock.

However, inflation is most unlikely to turn out exactly as shown. I added to the equation for \( \log P_t \) shown above the usual error term with zero mean and standard deviation, as estimated by the model, of 0.0443, and then repeated the calculation for 2,000 independent simulations. The resulting real rate of interest was approximately normally distributed, with mean 3.3\% and standard deviation 2.9\%. The range for 2,000 simulations was from −5.9\% to +13.9\%, and the distribution is shown below:
### Indexing Long-term Financial Contracts

<table>
<thead>
<tr>
<th>Real rate of interest</th>
<th>Number of observations</th>
<th>Percentage of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than -2%</td>
<td>69</td>
<td>3.4</td>
</tr>
<tr>
<td>-2% to -1%</td>
<td>84</td>
<td>4.2</td>
</tr>
<tr>
<td>-1% to 0%</td>
<td>98</td>
<td>4.9</td>
</tr>
<tr>
<td>0% to 1%</td>
<td>169</td>
<td>8.4</td>
</tr>
<tr>
<td>1% to 2%</td>
<td>231</td>
<td>11.6</td>
</tr>
<tr>
<td>2% to 3%</td>
<td>286</td>
<td>14.3</td>
</tr>
<tr>
<td>3% to 4%</td>
<td>256</td>
<td>12.8</td>
</tr>
<tr>
<td>4% to 5%</td>
<td>276</td>
<td>13.8</td>
</tr>
<tr>
<td>5% to 6%</td>
<td>184</td>
<td>9.2</td>
</tr>
<tr>
<td>6% to 7%</td>
<td>131</td>
<td>6.6</td>
</tr>
<tr>
<td>7% to 8%</td>
<td>104</td>
<td>5.2</td>
</tr>
<tr>
<td>8% to 9%</td>
<td>61</td>
<td>3.0</td>
</tr>
<tr>
<td>9% to 10%</td>
<td>33</td>
<td>1.6</td>
</tr>
<tr>
<td>over 10%</td>
<td>18</td>
<td>.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2,000</td>
<td>100.0</td>
</tr>
</tbody>
</table>

All but 1% of the cases fall into the range $-4.3\%$ to $+10.6\%$; all but 5% fall into the range $-2.4\%$ to $9.1\%$; and 75% fall into the range $0.0\%$ to $6.8\%$.

Even using this model, which assumes a reasonable decline in inflation and has a narrow 'funnel of doubt', the uncertainty in real rate of return seems to me to be uncomfortably large, even if the expected rate is reasonable. If one of the other models were used for the simulation then the range of results would be much larger, and in most cases the rates of return would be substantially negative.

### 2.5. Government borrowing

I have chosen a 13% coupon for my example because this is the approximate level of gross redemption yield at which the government issued stock during much of 1980, and at which institutions, including life offices and pension funds, bought the stock issued. During 1979 some £10,100 m net of such stock was issued, and insurance companies and pension funds bought net some £4,800 m of government stock (Business Monitor, MQ5, 3rd Quarter 1980). The stakes have been high. Has either side got what it wanted?

To the extent that life offices have issued essentially non-profit assurance or annuity contracts they may have satisfactorily matched their liabilities. But have the policyholders, then, got what they wanted? All source investment, eliminating intermediaries, goes back to some individual, either personally or as a prospective pensioner, or as the shareholder or direct owner of a company. I can conceive of no individual who wants a fixed money asset at some future date in preference to some real asset (other than to pay off a fixed money liability). He may, of course, be prepared to buy a fixed money asset because he hopes to get a better real value out of it, but he must know that he then takes a risk of not realizing his hopes. He will expect a better than actuarially fair rate of return on the money asset to compensate him for this risk.
Another way of looking at the previous example is to discount the real value of the 13% coupon and redemption amount at a 3% real rate of interest, and consider the distribution of present values. With the same 2,000 simulations we obtain a mean present value of £106.4 per £100 nominal (as expected, slightly more than par), with a standard deviation of £27.4, and a positively skewed distribution, shown below.

<table>
<thead>
<tr>
<th>Present value discounted at real rate of 3%</th>
<th>Number of observations</th>
<th>Percentage of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than £50</td>
<td>1</td>
<td>0.0</td>
</tr>
<tr>
<td>£50 to £75</td>
<td>185</td>
<td>9.2</td>
</tr>
<tr>
<td>£75 to £100</td>
<td>751</td>
<td>37.6</td>
</tr>
<tr>
<td>£100 to £125</td>
<td>652</td>
<td>32.6</td>
</tr>
<tr>
<td>£125 to £150</td>
<td>266</td>
<td>13.3</td>
</tr>
<tr>
<td>£150 to £175</td>
<td>102</td>
<td>5.1</td>
</tr>
<tr>
<td>£175 to £200</td>
<td>29</td>
<td>1.4</td>
</tr>
<tr>
<td>over £200</td>
<td>14</td>
<td>0.7</td>
</tr>
</tbody>
</table>

2,000 100.0

Of course, if inflation progresses according to one of the other stochastic models, which imply much higher future rates, then the discounted present value will be very much less than the values in the distribution above. If inflation turns out even higher than the optimistic model I have used then the investors of many thousands of millions of pounds will be disappointed in their achieved return. Many pension funds will be in severe financial difficulties. Many pensioners may be deprived of the pension they were, in real terms, expecting. And all this may happen quite regardless of the real prosperity or depression in the economy. Investors in fixed interest stock in the last 40 years in Britain have been repeatedly disappointed in the out-turn of their investment, regardless of the period having produced the greatest economic growth we have seen. The risks investors in fixed interest stocks still run need be emphasized no further.

2.6. Problems for the government—cash flow and PSBR

But what about the government side? Like any borrower at a high money interest rate it has a cash flow problem in addition to the uncertainty of the real cost of its borrowing. During 1980 the amount of interest paid on the quoted government debt was about £6,600 m, and the total interest payments on all government debt was about £10,000 m. This is the major part of the total Public Sector Borrowing Requirement (PSBR) for the year. Yet the gain to the government from the reduction in real value of the nominal quoted debt was about £8,600 m (i.e. the £66,000 m nominal in force at the beginning of the year, diminished by inflation of 15%). So in inflation accounting terms the cost of the quoted government debt in this year was nil; indeed the government made a profit of about £2,000 m.
This point is of substantial political importance. Much is made of the size of
the PSBR, and the government is committed to reducing it. Yet if the
inflation-adjusted PSBR is really quite small or even negative then there is a
danger that attempts to reduce the nominal PSBR may result in gross ‘overkill’.
There is an argument, at a time of high unemployment, in favour of arranging
fiscal policy on a ‘full employment’ basis, i.e. using a budget deficit to stimulate
the real economy. There is also a strong argument, at a time of high inflation, of
arranging fiscal policy on an ‘inflation adjusted’ basis. If we could get the
calculated PSBR back to near zero we could then see more clearly whether the
real PSBR was positive or negative.

Taylor and Threadgold (1979) have done the inflation accounting adjustments
much more carefully than I have done and show that for every year up to 1978,
but not in 1978 itself when inflation was much lower than in other recent years,
the real PSBR has been nearly zero.

2.7. Problems of falling inflation

Although in inflation accounting terms there appears to be no serious problem
for the government (providing, as we shall see, that inflation does not fall too
fast), there is a serious funding problem nevertheless. It is small consolation to a
house-owner to be told that his loan has diminished in real terms, if he has high
interest payments to make and he cannot readily borrow on the strength of the
potentially increased asset-value of his house. The government pays substantial
amounts of interest to the same pension funds, insurance companies and other
investors as it borrows the money from to pay the interest. Both sides so far are
happy. But if the investors lose their appetite for government stock then the
government will have great difficulty in finding the many thousands of millions
that it must borrow year after year. The government is in a ‘Catch 22’ position; it
can only fund its borrowing at ‘reasonable’ interest rates if investors believe that
inflation will fall; but it can only afford to fund this borrowing if inflation does
not in fact fall.

Some time this bubble will burst; investors, whether at home or overseas, will
lose all faith in the government’s fixed money paper, and the government will be
unable to fund voluntarily on any terms. There would then be a temptation for
compulsion, or at least ‘persuasion’ to be used. Alternatively, the current money
supply would be inflated to such an extent that the forecasts in one of my
‘pessimistic’ models might well come about.

The objective of this paper is to prick this bubble before it gets too big. The
issue of marketable index-linked stock to any holders, in large quantities,
preferably also by exchange for existing fixed money stock in a conversion offer,
would allow government finance to be put once again on a sound footing, remove
one of the obstructions to the reduction of inflation, and help to preserve all
long-term saving, whether through insurance companies and pension funds or
otherwise, from further ravages of inflation higher than expected, at the cost, of
course, of giving a lower, though less risky, return if inflation is lower than expected.

2.8. The future of government borrowing

I have tried to estimate the effect on government borrowing of a fall in the rate of inflation. Part of this exercise is subjective, since I have no formal model to estimate the interest rates at which the government will be able to borrow in future. These must depend in some way on the outlook for future inflation, which in turn must be influenced by the progress of inflation. Real factors will also have their influences.

I start by taking all marketable government stock issued up to the end of 1980 (and for simplicity assuming that it is fully paid and has a normal first interest payment). From this one can derive a schedule of known interest and redemption payments up to the fixed redemption date (and making suitable assumptions about stocks with optional redemption dates). I then assume that the government is prepared to pay each year, out of taxation, interest payments of \(2\frac{1}{4}\%\) of the nominal amount of all outstanding stock—representing a basic real cost taken as constant for all stocks—and then borrows in the market whatever is needed to cover the balance of interest together with redemptions due that year. It is necessary to make assumptions about future interest rates at which new stocks will be issued, and also about the term of such stocks. For simplicity the latter is taken as 20 years for all new issues, which are also assumed to be issued at par.

The rate of interest for new issues is made to depend on the rate of inflation in each future year, which also needs to be forecast. I express the interest rate during year \(t\), \(y_t\), as a function of the rate of inflation, \(i_t\):

\[
y_t = 0.025 + 0.04 + 0.6 (i_t - 0.04) = 0.041 + 0.6i_t
\]

i.e. the rate of interest is \(2\frac{1}{4}\%\) real plus an estimate of next year's inflation assuming an autoregressive (1, 1, 0) model with parameter \(0.6\) and mean \(0.04\). This roughly represents what the actual level of interest rates has been, but it is not based on a careful analysis of the historical evidence.

The measure of greatest significance is the real value of the 'real interest' charge, i.e. the \(2\frac{1}{4}\%\) I assume to come from general taxation. The real value of the net borrowing required is also of some importance. I shall quote examples of how these two values develop.

Next, I had to choose a set of future inflation rates. It would have been possible to use a large number of simulations again, but the profusion of answers resulting from this might have been less illuminating than some specific examples. I therefore chose three specimen simulated experiences from my first example, which showed real yields for the 13% 20-year stock of (A) zero (i.e. inflation fairly high), (B) 3.3% (i.e. the mean real yield) and (C) 6.8% (i.e. inflation fairly low). Specimens A and C are at the ends of the 75% range for the real yield.

The rates of inflation indicated by these three specimens and the resulting rates of interest for new money for the next 20 years are shown below:
In specimen A, prices rise 8.6-fold in 20 years, and the average inflation rate is 11.4%; in specimen B they rise 3.65-fold and the average inflation rate is 6.7%; in specimen C the corresponding figures are 3.23-fold and 6.0%. The latter two specimens differ in the incidence of reduced inflation, C showing high rates again in the last few years, B showing high rates still in the mid-1980s; this makes a substantial difference to the real yield on the security in my earlier example. But even in specimen A there is a period of low inflation in the mid-1990s.

The real value of the ‘real interest’ charge, the net borrowing requirement and the total interest charge in selected years for each specimen, relative to 100 in 1981, are shown below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Specimen A</th>
<th>Specimen B</th>
<th>Specimen C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inflation (%)</td>
<td>Interest rate (%)</td>
<td>Inflation (%)</td>
</tr>
<tr>
<td>1981</td>
<td>9.6</td>
<td>9.8</td>
<td>8.3</td>
</tr>
<tr>
<td>1982</td>
<td>13.4</td>
<td>12.1</td>
<td>6.1</td>
</tr>
<tr>
<td>1983</td>
<td>9.0</td>
<td>9.5</td>
<td>12.9</td>
</tr>
<tr>
<td>1984</td>
<td>17.6</td>
<td>14.7</td>
<td>15.5</td>
</tr>
<tr>
<td>1985</td>
<td>16.8</td>
<td>14.2</td>
<td>14.7</td>
</tr>
<tr>
<td>1986</td>
<td>20.4</td>
<td>16.3</td>
<td>20.2</td>
</tr>
<tr>
<td>1987</td>
<td>24.7</td>
<td>18.9</td>
<td>18.6</td>
</tr>
<tr>
<td>1988</td>
<td>21.4</td>
<td>17.0</td>
<td>9.3</td>
</tr>
<tr>
<td>1989</td>
<td>20.3</td>
<td>16.3</td>
<td>8.5</td>
</tr>
<tr>
<td>1990</td>
<td>16.9</td>
<td>14.2</td>
<td>12.9</td>
</tr>
<tr>
<td>1991</td>
<td>9.6</td>
<td>9.8</td>
<td>.9</td>
</tr>
<tr>
<td>1992</td>
<td>4.3</td>
<td>6.7</td>
<td>6.3</td>
</tr>
<tr>
<td>1993</td>
<td>6.3</td>
<td>7.9</td>
<td>4.4</td>
</tr>
<tr>
<td>1994</td>
<td>2.0</td>
<td>5.3</td>
<td>8.8</td>
</tr>
<tr>
<td>1995</td>
<td>-1.5</td>
<td>3.2</td>
<td>6.3</td>
</tr>
<tr>
<td>1996</td>
<td>-1.5</td>
<td>3.2</td>
<td>-3.9</td>
</tr>
<tr>
<td>1997</td>
<td>0.7</td>
<td>4.5</td>
<td>-4.5</td>
</tr>
<tr>
<td>1998</td>
<td>8.6</td>
<td>9.3</td>
<td>-2.9</td>
</tr>
<tr>
<td>1999</td>
<td>19.8</td>
<td>16.0</td>
<td>-5.1</td>
</tr>
<tr>
<td>2000</td>
<td>14.6</td>
<td>12.9</td>
<td>1.7</td>
</tr>
</tbody>
</table>
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The real interest charge in 1981 would be £2,042 m in each case, and the net new borrowing would be about £6,500 m varying slightly with the model. To this should be added £4,783 m of redemptions in 1981 to give expected gross new issues of about £11,300 m. By the year 2000 the actual ‘real interest’ charge would be about £11,000 m on projection A, £9,000 m on projection B and £6,500 m on projection C. Gross new issues rise in projections A and B, to £34,000 m in 2000 in A, £19,000 m in B; but in C they first fall, then rise only slowly to £15,500 m in 2000. In each case there is then a big jump in the year 2001 when all the hypothetical 1981 issues reach redemption.

We can see from this that a low inflation path, as exemplified by projection C, is much more onerous for the government than a high inflation path as shown by A. The real interest cost in 1991 under C is 2½ times what it is under A. Generally the real interest costs fall when inflation turns out to be higher than expected, and vice versa.

If, instead, all new issues were to be of index-linked securities with a coupon of 2½%, and the same assumptions otherwise are made, then the real ‘real interest’ charge is more stable in each case. The figures are:

<table>
<thead>
<tr>
<th></th>
<th>Relative real 'real interest'</th>
<th>Relative net new borrowing</th>
<th>Relative real total interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>100-0</td>
<td>100-0</td>
<td>100-0</td>
</tr>
<tr>
<td>1986</td>
<td>87-3</td>
<td>38:5</td>
<td>50:2</td>
</tr>
<tr>
<td>1991</td>
<td>76-8</td>
<td>13:7</td>
<td>28:8</td>
</tr>
<tr>
<td>1996</td>
<td>79-4</td>
<td>7:7</td>
<td>24:9</td>
</tr>
<tr>
<td>2001</td>
<td>79-7</td>
<td>2:3</td>
<td>20:9</td>
</tr>
</tbody>
</table>

|B  |                               |                          |                            |
|1981| 100-0                         | 100-0                    | 100-0                      |
|1986| 115-6                         | 63:5                     | 76:0                       |
|1991| 124-8                         | 42:8                     | 62:5                       |
|1996| 129-8                         | 21:9                     | 47:8                       |
|2001| 129-6                         | 6:5                      | 36:1                       |

|C  |                               |                          |                            |
|1981| 100-0                         | 100-0                    | 100-0                      |
|1986| 115-6                         | 63:5                     | 76:0                       |
|1991| 124-8                         | 42:8                     | 62:5                       |
|1996| 129-8                         | 21:9                     | 47:8                       |
|2001| 129-6                         | 6:5                      | 36:1                       |
The net new borrowing, under these assumptions is only required to finance interest in excess of 2½% on existing money stocks, and it declines substantially in all three cases, falling to an actual £1,366 m in 2000 on all three bases. The refinancing problem occurs when the first index-linked stocks come to be redeemed in 2001. Gross new issues in this year are £98,000 m on basis A, £41,000 m on basis B and £35,000 m on basis C. These should be compared with gross new issues in 2001 on the former, fixed interest, assumptions of £49,000 m, £31,000 m and £27,000 m respectively. Since it is assumed that the index-linked stocks are re-financed at the same 2½% real interest rate, the figures in the table above are unaffected by this re-financing.

Whether fixed money funding or indexed funding turns out to be cheaper for the government, or more profitable for the lender, is a matter of chance. But indexed funding will give a more stable course in real terms.

All these calculations relate only to the funding of interest payments and redemptions of existing stock, and assume that the ‘real interest’ charge is met from taxation. If there is any real increase in government debt, either through further budget deficits or because the ‘real interest’ charge is not met, then of course the amount of borrowing will be greater.

Finally, it is worth showing the figures on the assumption of fixed interest funding at a rate of interest of 2½% more than the current inflation rate in each year, i.e. adding 2½% to the inflation rate for each year shown in the table on page 315.

<table>
<thead>
<tr>
<th>Year</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>100·0</td>
<td>100·0</td>
<td>100·0</td>
</tr>
<tr>
<td>1986</td>
<td>79·9</td>
<td>112·5</td>
<td>103·6</td>
</tr>
<tr>
<td>1991</td>
<td>64·0</td>
<td>130·2</td>
<td>114·3</td>
</tr>
<tr>
<td>1996</td>
<td>106·4</td>
<td>135·5</td>
<td>128·6</td>
</tr>
<tr>
<td>2001</td>
<td>104·8</td>
<td>128·5</td>
<td>122·8</td>
</tr>
</tbody>
</table>

In each case the figures are higher than under the first assumptions, showing that the government gains out of being able to borrow on terms that assume a fall in the rate of inflation, provided that that fall does not then occur. If it had to borrow on the assumption that the current rate of inflation would continue—
might well happen if the market were to start believing one of the less optimistic models—then the real cost of government borrowing, and the real return to lenders, would be greater.

2.9. The Wilson Committee—arguments for index-linking

The case for the issue of index-linked securities has been well argued in Chapter 17 of the Wilson Committee Report (1980). Many of the members of that Committee would have liked to see the issue of index-linked government stocks (and index-linked mortgages for house purchase). The whole Committee recommended that the present impediments to the issue of company index-linked securities should be removed.

The arguments put forward by the Committee in favour of indexation of long-term securities can be summarized; first by the objections to fixed money securities:

(a) Savers intend their savings to be stores of purchasing power; assets whose values are fixed in money terms are unsuitable for this purpose.
(b) High nominal interest rates would prove a heavy burden to borrowers if inflation were to recede.
(c) High nominal interest rates give borrowers a cash flow problem.
(d) High nominal interest rates have deterred industrial investment.
(e) High nominal interest rates have imposed a cash flow problem on house purchase borrowers and have depressed investment in owner-occupied housing.
(f) The government's high borrowing requirement (to pay debt interest) makes it vulnerable to the vagaries of the market.
(g) The government has had to pay a premium to recompense buyers for the risk of holding fixed-interest securities, thus making its borrowing unnecessarily expensive.

The issue of index-linked government securities, company loans and house purchase mortgages would eliminate the problems listed above.

2.10. Objections to index-linking

Objections to index-linking are raised by the Committee and answered in part:

(h) Inflation provides a mechanism for the temporary reconciliation of inconsistent demands; if savers or pensioners are protected from inflation then inflationary pressure may be heightened. The Committee does not answer this. However, it is difficult to see how a saver who has entered into a long-term fixed contract, whether fixed in money terms or index-linked, can be accused of adding to inconsistent demands on the economy. His contract was fixed at the outset between a presumably willing borrower and a willing lender at a rate of interest acceptable to both. If other groups in society make inconsistent demands (e.g. by all wanting higher money wages or prices or profits) then it is unreasonable for this to result in windfall gains to the
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borrower at the expense of the lender. If the borrower is the one who wishes to renege on his contract, his action should be deplored, not encouraged.

There are, however, possible circumstances when the above argument might be reversed: if a society is emburdened with debt then inflation may be a sensible way for the unreasonably heavy claims of lenders to be denied. If a society of small farmers is heavily in debt to a small group of wealthy bankers who have been able to impose excessively stringent terms for their loans; or if a government has borrowed heavily to finance war expenditure and finds afterwards that total production is so diminished that debt interest cannot satisfactorily be met; or if a poor country at present has to borrow heavily to pay for oil imports whose price has been inflated by the monopolistic cartel that is also the largest international lender; in any of these cases there is an argument in favour of a renunciation of the debt; fixed-interest borrowing followed by inflation is one means of achieving this.

But none of these circumstances applies in Britain today. The lenders who have lost out are mainly present or prospective pensioners, whose personal savings have been eroded or whose pensions have not risen with inflation. When people cry for lower interest rates for house purchase mortgages, they are also asking for the incomes of depositors to be reduced. Index-linking of long-term securities or of mortgages is only an act of future social justice in favour of the elderly or in favour of ourselves when older. Furthermore, I do not suggest that existing contracts should be renegotiated; only that future contracts on mutually satisfactory terms should be possible.

Other objections discussed by the Committee are considered below:

(i) Indexation is potentially de-stabilizing because of its possible direct and indirect knock-on effects; I do not really understand what the Committee meant here.

(j) Indexation in capital markets would have implications for the taxation system. So far I have been talking in terms of gross yields, but interest is taxed as income, even though part or all of it is compensation for inflation. In addition some capital gains are taxed whether they arise from inflation or from real gains. The present tax system in these respects is illogical and unfair; the issue of index-linked stocks would highlight this unfairness; but that is no reason for not issuing them. Indeed they would mitigate this unfairness.

(k) Index-linking might put up the real cost of borrowing; in effect borrowing has been cheap because lenders have been deluded by high nominal rates. I doubt whether this has been true, and if so, I certainly doubt whether it would continue. On the contrary, borrowing on index-linked terms would be more secure, and therefore a lower expected yield would suffice. However, lenders may have been too optimistic in the past concerning the future progress of inflation, so that nominal interest rates have often, in retrospect, been too low.
Indexing Long-term Financial Contracts

(l) Index-linked securities would increase the cost of raising finance by other means; or equivalently would reduce the market prices of equities and fixed-interest stocks. The prices of equities, and the yields thereon, need not be affected. Both equities and real property provide dividends or rents which, subject to business fluctuations, are in principle measured in real terms. A dividend yield of 6% on ordinary shares is quite consistent with a real yield on index-linked securities of between zero and, say, 5%. I do not know what yield gap the market would require for equities, though I imagine it would be positive. The relevant question is: at what yield could index-linked gilts be sold consistent with the yield on equities remaining unchanged? That is the yield at which they would then sell.

Fixed-interest government stocks are a different problem. There is a huge glut of such stocks at present on the market, and much of it is in the hands of investors who would undoubtedly prefer a proportion of index-linked stock. A conversion offer, over a limited period, exchanging fixed-interest stock at market prices for indexed stock with suitable yields, would allow the market to adjust the quantities smoothly, without detrimental effects thereafter on the prices. It would not matter how much stock was converted provided that some, but not all, was; subsequent equilibrium would be achieved with anywhere between 10% and 90% converted. It should be possible for the government to pitch the terms to achieve this.

(m) Index-linked stocks would be more uncertain in nominal terms than fixed-interest stocks. Of course; but only those wholly ignorant of inflation would care.

(n) Index-linked stocks would increase pressure for the extension of indexation to other parts of the economy. There is of course a danger if there is widespread indexing of what are essentially 'spot prices' such as wages or the prices of goods. It is well known in economics that if all factor incomes are indexed then prices become unstable and will tend either towards zero or towards infinity. The equation

\[ x = kx \]

has solutions only if \( k = 1 \), or if \( x = 0 \) or \( \infty \). Total production is almost certain to change; someone's income must rise or fall to accommodate this change. However, rigid long-term indexing of wages is hardly likely to occur; flexible annual indexing is already widespread and inevitable; by this I mean that the general change in prices and in other wages is taken into consideration in any wage negotiations at present. However, no employer can bind his staff to remain in employment on terms fixed for a long period; and no trade union can force an employer to remain in business or to employ the same numbers at the same real wage indefinitely. Wages always adapt to some extent to market conditions; formal indexing, apart perhaps from month-to-month changes within one year, is irrelevant.
Finally it has been argued that any extension of indexation would be tantamount to an admission by the government that a substantial degree of inflation was likely to be with us for some years to come, an admission which the Radcliffe Committee suggested 20 years ago was ‘repugnant’. Against this some might argue that, after the experience of the 1970s, recognition that appreciable rates of inflation may persist for some time is no more than realistic (Wilson Committee Report, Section 845).

Precisely: I am against disease, not against immunization. I am against burglars, not against locks. I am against inflation, not against index-linked long-term contracts.

2.11. Choice of index

The Wilson Committee suggested that the most theoretically appropriate index to use for the linking of such contracts is probably the index of average earnings. While I accept their arguments, I consider that the Retail Prices Index meets some of their requirements more satisfactorily: it is unambiguous, readily available, and not subject to subsequent revision. It is calculated monthly, based on prices about the middle of one month, and is published about the middle of the next month. It is carefully constructed, based on a very large number of representative prices, is re-weighted every year, and is under the supervision of an independent committee.

It is also desirable, in my view, that the index should be the one that is likely to show the lowest rise over a long period. The earnings index has risen by some 2% a year more than the price index over many years, and the two have been reasonably well correlated. For contracts with an interest payment any expected differences between indices can be allowed for in the interest rate; it is easier to work with positive, than with negative, rates of interest. And it would be awkward, though not of course impossible, to sell, say, zero-coupon securities above par, to give a negative real rate.

Some further practical observations can be made: it would be convenient for the Retail Prices Index not to be re-based to 100, as it has been from time to time; re-basing is unnecessary.

It would also be convenient to the market, for stocks to be issued and quoted in terms of the same Retail Prices Index, not in terms of 100 at the issue date. The present series of Index-linked National Savings Certificates is made unnecessarily complicated by each certificate being issued for £1 at the date of issue. Instead, they should be quoted at a price per bond both for purchase and subsequent resale. This would allow the maximum holding to be expressed as a certain number of bonds rather than a certain number of pounds.

The interest and redemption payments should be wholly linked to the index, with no provisions guaranteeing minimum money amounts. Such provisions are unnecessary and demonstrate a mis-understanding about the concept of index-linking. Real values should be maintained if prices ever fall, just as if they rise.
2.12. ‘Granny Bonds’

The government has, in fact, accepted the idea of borrowing on index-linked terms. The first series of National Savings Retirement Certificates was issued in June 1975 by the previous government, and the present government has recently extended the amount and availability of these bonds. Both the single premium bond available only to older persons and the monthly premium ‘Save As You Earn’ contract for any subscriber have been reasonably successful as National Savings media. The total raised up to the end of 1979 from the retirement certificates was £1,300 m, and from the SAYE issue was £350 m.

This is, however, fairly small compared with the sums raised by ordinary marketable stock from mainly institutional investors, who derive their funds from the very large volume of life assurance premiums and pension fund contributions, as well as from re-investible interest.

One problem is that a single premium bond, providing no income at all, is not very attractive to a retired person unless as an investment incidental to his or her main portfolio from which they can derive income. To derive income from the bond requires selling part each year, and this is, at least, a cumbersome procedure. For the small investor the bond is unsuitable; for the large investor the amount that can be held is too small. The limit of holding has been raised from its original £500 to £3,000 in the new series. This is still far too low to have a major effect on diverting personal savings. Even £10,000 would be a relatively low limit.

Additionally, what retired people require from their investment is income. Rather than sell bonds, the government should sell index-linked annuities, based on whatever interest rate they think appropriate, but providing a monthly or quarterly annuity payment for life or for a fixed term. However, this would be more satisfactorily achieved by making index-linked stocks available to life offices (see part 3).

The only moderate success of the virtually zero interest bonds and SAYE contracts, in spite of their attraction in principle to high tax payers (the proceeds being free of tax), suggests that zero interest marketable index-linked securities would not be overwhelmingly attractive. Investors look for some small real yield, and in comparison with other forms of investment a zero real yield would attract only limited funds.

2.13. Company securities

The Wilson Committee came down wholly in favour of companies being able, at least, to experiment with the issue of index-linked long-term loan stocks. C. G. Lewin, in his recent paper to this Institute (‘The opportunities for capital investment’, J.I.A. 108, 19) also supported this idea. While I, too, am in favour of the impediments to companies borrowing in this way being removed, I do not see the problem for companies as being so great as for the government.

Companies have, very sensibly, refrained from long-term borrowing on fixed-money terms at high nominal rates; so the volume of existing stock is not
large and the interest cost is not excessive. Companies instead have borrowed short, sometimes at high nominal rates so that they have a cash flow problem, but with proper inflation accounting their profits have not been seriously affected. The real cost of short-term borrowing has been known and has not been exceptionally high.

It should be remembered that a company has only its trading profits (before interest and tax charges) to service its capital. How it apportions these profits between different providers of capital is a secondary problem. It is sensible for the company to arrange its affairs so as to reduce its tax charge—which it can do, at present, by having enough debt—and it is also sensible to offer different forms of security to providers of capital who may have different time horizons, or risk preferences. We are, therefore, discussing only the apportionment of profit between shareholders, loan-stock holders and lenders of short-term cash such as banks, i.e. between different classes of investor, or even between different sections of the same investor’s portfolio.

For smaller companies the question of control enters the picture; but larger companies always have the possibility of raising equity capital rather than index-linked debt. No such option is readily available to the government or to house purchasers.

Incidentally, I think it would help understanding if companies were to publish an analysis of their ‘value added’, partitioned between Labour (wages, salaries and ancillary benefits), Capital (interest charges and profits and probably also rental and leasing charges) and Government (taxation less grants). High money profits figures need to be compared with the portion going in wage costs.

2.14. House purchase loans

The other major area of long-term debt in the economy is house purchase loans, financed mainly by building society deposits. In a formal sense these are all short-term, in that the interest rate is normally revisable at short notice, even though it is expected that the actual loan will remain outstanding for many years, as indeed do many deposits. So also does much company short-term borrowing. But the house purchaser is in a less favourable position than the company in terms of tax and cash flow. He has a heavy cash flow problem; but he cannot ‘capitalize’ interest without losing tax relief, which is available only on interest actually paid; and it is laborious and costly for him to effect additional loans to cover the interest, if indeed the building society will allow it.

A formally index-linked loan that spread the real cost of repayment evenly over the working lifetime of the borrower, either with a variable or fixed real interest rate, and matched by comparably indexed deposits, preferably for fixed terms of 5 or more years, would aid considerably in smoothing out the present vagaries of the house purchase market and hence aid the house-building industry, as is suggested by the Wilson Committee. Without tax reform an index-linked loan is an unattractive proposition. But the tax reform needed is simple; at present most loan interest attracts tax relief, and building society
deposit interest is taxable. The net effect to, or from, the Exchequer must be small. If loan interest relief were scrapped, and building society interest were also free from tax, the loss of tax revenue would be trivial, index-linked loans could stand on a par with fixed money loans, and there would be a substantial saving in the Inland Revenue's administrative costs. The nominal interest rate on building society loans and deposits would initially fall to the present net rate so that index-linked loans even at zero interest might look expensive to the borrower, and good value to the lender; but eventually equilibrium would be reached.

2.15. Taxation

Money incomes are subject to income tax and money capital gains are subject to capital gains tax. No indexing of the base for capital gains tax computation is at present allowed, and there is no offset for real losses on the holding of money securities. The taxation system works as if inflation did not exist. The effect is that a heavy tax is levied on the real value of capital. Few taxpayers have been able to 'keep up with inflation' net of tax.

Such a tax on the real value of capital might be considered by some to be politically desirable; such a proposal could be discussed on its merits. But the situation into which our tax system has accidentally put us was presumably not the intention of those who framed the legislation, but the result simply of applying rules designed for a period of stable prices in a period of sustained inflation. The present tax system has neither political nor moral justification, but only that of legislative accident; nor has it even the merit of simplicity.

It is not surprising that considerable effort is made to alleviate tax, nor that life assurance schemes are found to be a way of effecting such alleviation. In my view this has had regrettable results, in that the life assurance industry is being to some extent diverted from its true objectives of spreading risks and of accumulating savings into the wasteful exercise of tax mitigation.

The introduction of index-linked stocks would highlight these anomalies. The index-linked Retirement Bonds and SAYE schemes provide practically zero real yields free of tax. They are therefore attractive to high taxpayers and their issue has been restricted. If a quantity of marketable index-linked stocks were issued by the government, with interest taxable but money capital gain free of tax (as are present government stocks) then in the first instance these would also be attractive to high taxpayers, who would accept small, or even negative real yields. They would be unattractive at these prices to gross pension funds, for which a high nominal interest rate has no tax penalties.

If sufficient index-linked stocks were issued, or if a large-scale conversion offer took place, then the market yields would have to be such as to attract pension fund money too. The increase in net yield to the high taxpayer would of course be quite small. For such an investor, however, fixed money stocks would not be attractive, and ordinary shares where capital gains tax was levied on money gains would also have a restricted appeal. Private investors can now realize each year a moderate amount of gains, free of gains tax, anyway.
Indexing Long-term Financial Contracts

The most logically satisfactory solution would be the full indexing of the base purchase prices for capital gains. This has been felt to be administratively impossible. Certainly to allow a real loss on fixed money assets such as deposits would add enormously to the complications. But it is not essential to eliminate all anomalies for equity to be achieved. Provided each class of investor has a sufficient range of securities which give him a fair net of tax return, then it does not matter that securities outside that range are not, for him, tax-efficient.

The issue of index-linked government stocks, free of capital gains tax, would seem to require no changes at all in present legislation. This first step would make available to all investors an equitable investment. Any consequential anomalies remaining could be dealt with subsequently.

2.16. Conclusion

The issue of index-linked government stocks, fully marketable, and as a major part of new government borrowing would be beneficial to the government, to taxpayers and to investors. There are no serious adverse indications, and I would urge the government to proceed with these forthwith. Changes in taxation which would make practicable the issue of index-linked company securities and of index-linked house purchase mortgages would benefit those markets too, and could usefully be implemented.

3. INDEX-LINKED LIFE ASSURANCE

3.1. Background assumptions

Without a sufficient supply of index-linked assets available it is difficult, though it may be possible, to arrange index-linked life assurance contracts. In what follows I shall therefore assume that index-linked securities for a variety of terms and in sufficient quantity are available to any investor, and that such securities are subject to income tax on the interest, but not to capital gains tax on at least the purely monetary gain.

We cannot rely on an unlimited supply of index-linked securities in the future. If inflation were to reduce, and fixed money interest rates fell to something like the 3% on index-linked securities, then the government might well prefer to borrow (or re-finance) on fixed-money terms. Inflation might then go up again at a time when index-linked securities were not easily available. An office might, therefore, prefer to restrict the term of policies to within the term of the available index-linked securities, or to include in policies a provision allowing it to stop index-linking if the government were to stop issuing index-linked securities.

3.2. How inflation harms traditional life assurance

Conventional endowment and whole-life assurances, with or without profits, used for many years to serve policyholders well. Even in recent years some life offices have provided returns on maturity comparable with an investment at zero
interest in a security linked to the Retail Prices Index, and have felt quite pleased with their achievement.

Policies with level annual premiums have, however, three disadvantages in an inflationary period: (a) the basic life cover does not rise with inflation; reversionary bonuses cannot, practicably, match the rate of inflation; (b) the savings element in each premium diminishes in real value; (c) the proportion of each premium devoted to expenses (other than a percentage commission) increases. This is most extreme for policies with small premiums. I do not know enough about how industrial assurance has been affected, but the premiums on the smallest of industrial assurance policies must be hardly enough to cover the cost of collection. At its most extreme, as British companies have found in certain overseas territories, it becomes not worth while collecting premiums at all, and it may hardly even be worth the assured’s while collecting the claim proceeds.

I appreciate that we must at present work within the existing framework, but life assurance business in Britain has perhaps become so shackled with rules suitable in a period of stable prices that we are in grave danger of failing to meet the requirements of the public in even the moderately inflationary period we are now experiencing.

3.3. External constraints

There are many external conditions that need to be considered by any life office thinking of issuing an index-linked assurance or annuity contract. Some of these external constraints could be altered by the government or by the industry: none is irrevocable.

The present qualifying policy rules require that no annual premium is more than twice any other in money terms. This would restrict index-linked annual premium policies to allowing indexed premiums only for a short period; with inflation at 20% the limit would be reached within 4 years. It is necessary for the qualifying policy rules to be altered to allow an index-linked policy which would qualify were inflation to be zero.

There might remain a problem about the guaranteed minimum sum assured of 75% of the total premiums due; to be logical the rules should require that this sum assured also be fixed in real terms. But at very low interest rates, such as would be appropriate for index-linked policies, it is not hard to find that whole-life policies (where premiums are assumed to cease at age 75), or even long-term endowment assurances, with a loading for expenses and also bonus, have sums assured below the required limit. It was never the intention of those framing the legislation to exclude such traditional styles of policy, and sensible revision of the rules would be in order.

Stamp duty is at present based on the maximum sum assured or annuity in current pounds. It would be logical for the amount to be measured in pounds at the time of issue; that is when the duty is paid. But I do not know whether the Inland Revenue’s attitude concerning this has been sought.

The tax-free capital content part of a purchased life annuity is based on the
return of the money capital over the lifetime of the annuitant, and for a variable annuity it is a fixed money amount over the term of the annuity. It would be consistent for the capital content of an index-linked annuity also to be indexed. Fixed money annuities would then appear to be taxed unduly heavily, so in practice the capital content of all purchased annuities should be indexed. This would be consistent with charging capital gains tax only on gains in excess of the indexed purchase price.

The Inland Revenue limits for pension schemes are now fairly well relaxed so that final salary schemes can in effect provide index-linked pensions. I shall return to these in part 4. It need only be observed here that the various limits for Self-employed Retirement Annuities should also be re-framed to allow the self-employed to effect fully index-linked pension policies.

The present commission agreements affect only those life offices that adhere to the various associations. They nevertheless affect the way a large amount of life assurance business is sold. Much 'new' life business is simply restoring the real value of the policyholder's premiums and life cover. Index-linked policies would therefore diminish future nominal new business, whilst maintaining future annual premiums. Agents or brokers would therefore certainly gain future renewal commission but probably lose some initial commission. I do not know whether they would consider the trade-off worth while, or whether a higher initial commission for index-linked policies would be appropriate.

Index-linking would not adversely affect those classes of policy where commission is a level percentage of premiums throughout. In fact, with a guaranteed real rate of renewal commission a rather lower percentage rate might be suitable, since increases would be automatic rather than having to be sold.

3.4. Policyholders’ objectives

I have already mentioned that ‘source investors’ always want to maximize the value of their investment in real terms. An individual will normally save during his working lifetime, but dis-save, or live on his pension or investment income, during his retirement. After the event the maximum real income is also the maximum money income; but security consists in the provision of an income fixed in real terms, such as an indexed annuity.

If we assume that an investor can invest £1,000 now to give £60 p.a. initially on ordinary shares or property, or £120 p.a. on a fixed-interest perpetuity, and ignore tax, then we can postulate that he would prefer an indexed security yielding less than £60—say only £30—to either of the available alternatives. A secure, indexed income of £30 initially, growing with inflation, may be just preferable to say £60 from ordinary share dividends with their attendant uncertainty and may be just preferable to a fixed £120 with no subsequent increase. Indeed, if he imagines that he can afford to spend all the £120 he is being very improvident. He should spend no more than £30 to £60 initially, re-investing the rest to provide an increase in his spendable income next year and thereafter.

My suggested figures of £30, £60 and £120 may not be those that everyone
would choose. The trade-off between them may differ from one individual to another, and someone may be prepared to exchange one security for another at differing prices depending on his particular level of wealth, existing securities and perception of the future.

The essential point, however, is that all individuals will see an indexed certain income as more secure than a fixed money one, or than one based on equities of any type. Whether to invest in shares or in fixed money stocks becomes a speculative investment, in which security is given up in order to get a possibly higher (but possibly lower) real income. Also at this stage one would have to look at the effect of taxation.

The above analysis applies to individuals saving privately for retirement, or investing the proceeds of their savings on reaching retirement. It also applies to self-employed persons saving for their retirement through a personal pension policy. It may not apply to the employer with a pension scheme. His objective is not necessarily to do the best for his employees; he may wish to provide an acceptable pension scheme at minimum cost to himself; he may wish to use the pension scheme to deter staff from leaving; he may not care what standard of living his pensioners experience, especially where they retired many years previously. The responsible employer, however, or the responsible employee’s representatives, will wish to ensure that the pension fund is organized for the benefit of the employees, past and present, as if the contributions were in fact savings made out of their own incomes. The employer acting properly on behalf of his employees should therefore behave in the same way as his employees individually would.

We can therefore assume that some individuals will buy index-linked assurances or annuities or pension policies and some employers will also want to buy wholly index-linked deferred annuities to meet pension liabilities, in both cases provided that what is offered is not at a substantially worse yield than the purchase of index-linked securities in the market. It therefore does not seriously matter what yield basis an office needs to use for calculating premiums, provided its tax status is no worse than that of its policyholders. If private pension funds were prepared to buy index-linked securities at 2% gross redemption yields, they might well buy deferred annuity policies, that suit their liabilities exactly, at 1\(\frac{3}{4}\)% or 1\(\frac{1}{2}\)%. If individuals are so enthusiastic about index-linked securities that they bid up the prices of dated securities to give a nil yield, net, then they would also be prepared to buy life assurances that gave them a return of \(-\frac{1}{2}\)% net, some margin being worth paying for the convenience of assurance.

3.5. Actuarial considerations

Before offering any index-linked policies an office would need to be satisfied that it could suitably match its liabilities by buying the right sort of assets. However, with index-linked securities and policies it is easier to match the durations correctly, since at low interest rates securities are much longer than at high interest rates. One may only need to be careful that the range of durations of
the liabilities matches the range of available securities. It may be necessary to avoid writing policies that are too long for the available securities. One may also have to avoid getting the liability portfolio too short. But it should be possible to adjust the dating of the liabilities by a suitable mixture of immediate annuities and annual premium endowment assurances, pure endowments and deferred annuities.

If an office were to issue only without profits index-linked policies it would need to have index-linked contingency reserves too. These could, perhaps, be supplied by the ordinary with profit policyholders by investing part of their surplus in this contingency reserve, which may be for them a satisfactory investment. Or an office may wish to offer some with profits index-linked policies too. However, these would not be essential, unless the index-linked business grew very large, or unless prospective index-linked yields seemed to be very uncertain. This could be the case if early index-linked issues were bid up to give very low yields, but it could reasonably be expected that future issues would appear with higher yields. One might then offer annual premium policies based on, say, $\frac{1}{2}$% yield, but with the expectation that, if yields rose to 3% in future, some index-linked bonus could be added. Such refinements would hardly be necessary for single premium policies, since the amount to be reinvested would be much less.

Provided the policies are wholly index-linked, with no fixed money alternatives, then premiums can be calculated at index-linked yields in the classical actuarial manner. Valuation would be at index-linked yields and expressed in current £ equivalents of index-linked values. It would be as if we were working in a different 'currency' throughout.

An office would need to be very careful about including fixed money alternatives. For example, the return on death for a deferred annuity should be expressed in index-linked terms. Premiums and benefits should be expressed wholly in index-linked terms, so that if the index reduces, so do the benefits (whatever the government says about its index-linked securities). One should avoid, for example, deferred annuities where the amount of annuity is index-linked up to vesting and fixed thereafter---instead one should offer an index-linked cash option, with freedom to purchase at current rates on vesting.

3.6. Types of policy
(a) Full premium annual premium policies such as whole-life and endowment assurances are, in some ways, the obvious first choice for index-linked policies. Qualifying policy rules, however, would hinder their issue, until the rules were changed. Because of the uncertainty about the future supply of index-linked securities it might be safer to limit the term of such policies to no longer than the longest available such security. This would rule out whole of life policies. However, endowment assurances for a restricted term would in fact be safer in this respect than annuities, except at the very oldest ages. The probability of a life aged 65 surviving to age 105 is small, but not
wholly negligible; payments later than the maturity date of an index-linked endowment assurance are impossible.

These conventional policies have the great advantage of providing a sum assured that changes with inflation, thus providing a satisfactory real level of death cover for the policyholder. They have the advantage for the office that the premium also changes with inflation, providing protection for its expenses. They alter the policyholder's savings element in the same way, providing him with a sensible savings plan. Initially there would be uncertainty concerning future interest rates on index-linked securities, so an office might have to use a cautious rate of interest. This might justify a low rate of interest and a small bonus element. But once a stable level of index-linked yields had emerged both with and without profit policies would be feasible.

(b) Low premium index-linked policies such as term assurance and family income benefit would also be sensible. Indeed, one company has had index-linked FIB policies on the market for some time; but these are only index-linked up to the death of the life assured, not thereafter. No new principles are involved; the reserves are low, and interest rates do not affect them much; one might need only to limit the term.

(c) Ordinary immediate annuities would present problems if the capital content were still determined in such a way that too high a proportion would become taxable. They would need to be treated as alternatives to the direct purchase of index-linked securities, and the relative tax position would be important. Immediate annuities, however, like all single premium policies, are satisfactory contracts in the first place for a life office, since the yields could allow directly for the actual yields in the market.

(d) Index-linked (pension) immediate annuities present no tax problems. Individuals would find them an attractive alternative to level money annuities, where they are allowed to use the proceeds say of a personal pension policy to purchase an annuity in the open market. The initial return per £1,000 consideration would, of course, be lower than for a level money annuity, but this would not inhibit many purchasers. Some employers may also be prepared to buy index-linked annuities for retiring pensioners, in respect of at least part of their pension.

(e) Group deferred annuity contracts are entirely appropriate for final-salary based schemes, and an annuity that is index-linked after vesting is a suitable benefit for pensioners. Some employers would be able and willing to provide these, perhaps in respect of part of the pension with the remainder being fixed in money terms. Pension schemes are dealt with more fully in part 4.

(f) Group life contracts do not need indexing, being yearly renewable contracts.

(g) Individual (pension) deferred annuities (e.g. for the self-employed) are entirely suitable for indexation. They could be by annual or single premium, with a fixed index-linked cash option (and purchase of either type of annuity at current market rates) or with a fixed index-linked annuity (though not with
both options), with or without an index-linked benefit on death. These would be attractive contracts for the self-employed individual, more so perhaps than the present contracts on offer that rely too much on an uncertain future bonus to maintain their value, and have the severe disadvantage of tying up the individual's savings in a non-assignable, non-commutable form, which many individual entrepreneurs do not find acceptable. Even a modest guaranteed real return would attract savings here.

3.7. The index to be used

An office would probably follow the same index as used for the government index-linked securities. One would need to know what the index was, how frequently it was calculated, and when it was published. The Retail Prices Index is calculated monthly, quoted as at the middle of month $X$, and published in the third week of month ($X + 1$). It could therefore be used for payments made in month ($X + 2$), say. However, there would need to be provision in the event of its not being published, due to special circumstances.

I am assuming that an office would revise premiums or annuity payments monthly, if possible, but the alternative would be to up-date them once a year, say, on the policy anniversary. The Wilson Committee suggested that indexed securities could be linked to an annually calculated earnings index, calculated as at April and published about October; its only merit seemed to be the absence of subsequent revisions, but it is possible that the Bank of England would consider it as easier to up-date the index on which government stocks were based only annually. The trouble with the earnings index is that payments in October of year $X$ may still be based on the index for April of year ($X - 1$), i.e. be 18 months out of date, which is not a very satisfactory way of maintaining real values.

3.8. Practical and administrative points

It would be necessary for an office to consider all the relevant administrative problems. The list below of points to be noted is not necessarily comprehensive:

(a) The computer systems for making and receiving index-linked payments would need to be set up. But apart from the final 'currency conversion' most present office systems would cover most of what is needed for index-linked policies. The exact timing of premium collection and annuity payments might be important. Direct debit for all renewal premiums would be the best method of collection.

(b) Index-linked policies would need to be kept separate for all valuation purposes, but could be treated as having just a different currency.

(c) Similarly for accounting purposes; but it may be necessary to record index-linked revenue premiums, say, in index-linked units of a particular month, and then premiums outstanding in terms of constant £s. Ultimately payments would be made in £s, and the final accounts would also be in £s; but accounts in index-linked units might also be required. Some accounting
systems might be able to cope easily, but otherwise careful changes would be necessary.

(d) Suitably matching index-linked investments would need to be purchased. Some index-linked investments might be made out of surplus, to provide 'capital' for the index-linked business. More index-linked investments might also be purchased as an asset of the existing business. Careful accounting would again be necessary.

Many of these administrative details could not, of course, be settled until index-linked stocks were actually on the market, and the basis of indexing was known.

3.9. Marketing

Comparisons would obviously be made with fixed money contracts. A valid comparison could not be made until after the event, since no one can forecast inflation over a long period with any certainty. In any case policies provide a series of payments (or have various probabilities of providing a payment at a particular date), so are not necessarily directly comparable. The best style of approach would be to say that £1,000 index-linked will always be worth £1,000 in real purchasing power, whereas £1,000 in money will be worth varying amounts, depending on inflation; e.g. if annual inflation is as shown over specified periods, £1,000 will buy the following:

<table>
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<tr>
<th>Years</th>
<th>Inflation 5%</th>
<th>15</th>
<th>25</th>
<th>35</th>
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</thead>
<tbody>
<tr>
<td>15</td>
<td>481</td>
<td>295</td>
<td>181</td>
<td></td>
</tr>
<tr>
<td>15%</td>
<td>123</td>
<td>30</td>
<td>8</td>
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</tr>
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<td>25%</td>
<td>35</td>
<td>4</td>
<td>0.4</td>
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For payments at a given date it would always be possible to quote the level rate of inflation at which an index-linked amount would exactly equal a fixed money amount. But this does not much help for with profit quotations.

The real comparison is with the riskiness of fixed money contracts. With an index-linked contract you know what you are buying. With a fixed money contract you are banking on inflation being low enough. Is this a sensible risk for the policyholder to take?

3.10. Index-linked policies without index-linked securities

A number of the difficulties caused by fixed premium policies could be surmounted by issuing unit-linked policies with index-linked premiums. The policyholder would pay a premium that retained a constant real value, representing the same real investment each month. The life office would receive a premium on which the expense loading would rise with inflation. The savings element of the premiums could be invested in whatever type of unit the policyholder or life office chose. Obviously ordinary shares or property would be
likely to maintain their real values better than fixed-interest investments, but there would be no problems, in principle, if fixed interest investment were chosen. The sum assured on death would be best expressed as a function of the unit value and the current value of the premium, such as 'the value of the units' plus 'the current premium times the number of premiums still to be paid'. The sum assured on maturity would be equal to the value of units. It would be best if no guarantees about the value of units were given, whether in fixed money terms or in real terms.

Sadly, such an eminently practical policy runs into difficulty with our absurd 'qualifying policy' rules.

3.11. Conclusion

The existence of index-linked securities would allow life offices to issue a whole range of index-linked assurances and annuities, parallel with traditional fixed-money ones. In some respects such policies would be easier to arrange, being in principle more like traditional policies at low rates of interest. Such policies would allow the real life assurance market to be revived and discourage life offices from the temptation of becoming mere 'tax mitigation' vehicles. Policyholders would receive what they really need; and life offices would be protected from excessive inflation of expenses. There is a challenge to offices, and to actuaries, to devise suitable schemes, and a challenge to the government to get rid of the unnecessary and irrelevant restraints on such policies. I am convinced that without index-linking, life offices in Britain will face a most unhappy future if inflation continues; with index-linking they can survive.

4. INDEX-LINKING AND PENSION SCHEMES

4.1. Introduction

This paper was written before the Committee of Inquiry into the Value of Pensions under the chairmanship of Sir Bernard Scott reported; however, it is likely that this Report will be available when the paper is presented.

Index-linked pension benefits for public sector employees have attracted a great deal of resentment and opprobrium, in my view quite unjustifiably. When pension schemes were first set up it was never intended by employers, nor expected by employees, that pensions would have a rapidly declining real value. Indeed, had the consequences of fixed money pensions in a period of severe inflation been apparent at the outset, it is unlikely that occupational pension schemes on this basis would ever have been established.

The problems of salary inflation during service have been recognized. Average salary schemes have generally given way to final salary schemes. Curiously, average salary schemes with the salary revalued each year in line with some inflation index have not attracted much favour, although these would suit the same groups of employees as the original average salary schemes did, those whose real earnings decline as they approach retirement.

In private sector schemes some allowance for inflation for pensions in course
of payment is often made on a discretionary basis. If the practical effect on this
discretion is that pensions are in fact increased according to some inflation index,
then there is little to differentiate this from formal index-linking. However, many
pension schemes do not supplement pensions fully for inflation, or at all, and
pensioners of such schemes have been amongst those who suffered most from the
inflationary squabble that has so distorted the economic life of the past decade. It
is worth stressing that inflation recently has been a purely monetary feature, and
not a consequence of real shortages; real national product (i.e. gross national
product at factor cost at constant prices) in 1979 was higher than ever before, and
was 21% higher than it had been 10 years previously; the total population was
only 1% more than in 1969. In spite of the oil crisis there has been, up to the
current recession, no assault on real standards of living in the United Kingdom,
only a redistribution of incomes.

4.2. Choice of index

There is a reasonable area for discussion as to which index pensions should be
linked to. Over the period 1946–80 the earnings index (average adult male
manual earnings) rose by 2.3% p.a. more than the Retail Prices Index (i.e. 9.1%
against 6.8%, October to October). Is it reasonable for pensioners to receive a
fixed real purchasing power, based on the Retail Prices Index? Or is it reasonable
for them to share in any overall increase in prosperity and conversely share in any
necessary decline? It may even be thought reasonable, at least for certain posts,
that the pension of an ex-holder of the post should be in a fixed ratio to the
current remuneration for that post. Yet should a pensioner gain or lose
accordingly as the perceived value of his successor's post changes, if indeed a
comparable post still exists?

The index to be used is more critical here than with interest bearing
index-linked securities. The price for the latter can take into account the index to
be used, and indeed more than one index could be in use for different securities
which would bear different yields according to the market's expectation of
different rates of change of the indices. No such adjustment exists for pensioners
except as regards the proportion of salary on which the pension is based.

Two irrelevant arguments are sometimes put forward: first, that pensioners' ex-
penditures differ from those of the working population, and that therefore a
different index to reflect their particular costs should be used. This may be true,
but it is not obvious to me that there would be any bias in one or the other index,
i.e. that a pensioner's costs index would show greater, or smaller, changes than a
general Retail Prices Index on average. The indices would be closely correlated,
and a random discrepancy of a few per cent a year would be of no significance.

The second is that pensioners' expenditures decline in real terms as they get
older, and that therefore pensions declining in real terms are appropriate. That
this argument can be seriously put forward shows only the inexperience of those
who propose it; many elderly people require to spend more on care and attention
in their final years, not less, especially those who cannot rely on the support of
children or younger relatives still at work. It has been well established, e.g. by Townsend (1979) that many old people, particularly the very old, are in serious poverty. But many old people may be well above this sort of absolute poverty level, and still be well below the standard of living that they had expected their pension and other assets to provide.

4.3. What level of pension?

The level of pension benefit, e.g. the fraction that a full normal pension is of final salary, of course affects the contribution rate as a percentage of salary. The actuary who is investigating a particular scheme will use his traditional methods at a suitable rate of interest to calculate the contribution rate. An alternative approach is to look at the overall national position.

For the elementary calculations that follow I have used population figures for Great Britain for 1978. As will appear, the absolute numbers are not important, only the relative proportions; there were about 25.2 m people in the working population, 17.3 m men and 7.9 m women. We shall assume that they all earn the same uniform salary (obviously unrealistic, but we shall revert to reality later); there were about 9.4 m persons of pensionable age (3.1 m males over 65 and 6.3 m females over 60), and an additional .5 m widows under age 60 (mostly over age 50).

Now assume, first, that all male pensioners receive a pension of two-thirds of the uniform salary of those in work, and that all female pensioners and younger widows receive a pension of one-third of the uniform salary (of course this is too hard on single women who worked, but rather generous for married women who did not). The total pension cost would be 4.2 m times the uniform salary, implying a cost of 17% of the total salaries of those in work.

Assume, secondly, more realistically and more generously to women, that half the female pensioners worked and receive a pension of two-thirds of the uniform salary, and that all widows receive a pension of one-third (so that widows who worked receive, generously, a full salary). The total pension cost would be 5.2 m times the uniform salary, or 21% of the total salaries of those in work.

We can now relax the uniform salary assumption. The results would be the same if the distribution of final or other salaries on which pensions were based were the same as the distribution of salaries of those in work. Many salaries increase with age, and in spite of 'equal pay' legislation, male salaries are still higher than female ones. On the other hand if pensions were linked to a prices index rather than an earnings index there would be an adjustment in the opposite direction.

The percentages based on current numbers will vary if the relative proportions in each age group change. In fact there is unlikely to be any significant change in this respect for many years.

4.4. Actuarial contribution rate

The percentages calculated above would only be the same as the actuarial
contribution rate if a set of stability conditions were fulfilled—e.g. the population proportions not varying, there being no differential mortality by size of pension or by marital status, and there being no State pension to consider—and also if the real interest rate, i.e. the excess of interest rate over salary inflation, were nil. In a ‘stable population’ situation ‘total contributions’ plus ‘total interest income’ would equal ‘total outgo’; before that stage is reached any excess of contribution income goes towards increasing the fund. For the economy as a whole the same equilibrium applies; the total incomes of those not employed must come from transfer payments in the form either of pension contributions or from interest earnings on capital assets; any excess of contributions is an addition to savings and can be transformed into real capital assets unless it is absorbed by dis-savings elsewhere.

It is arguable as to whether contribution rates of the order of 17–21% of salary are acceptable to employees. I say employees because, while it may seem to be the employer’s choice, in reality what he can spend on total employee remuneration depends on the profitability of his business and the value added by the employees. The employees have the choice, in a most indirect way, as to how much of their remuneration is transferred to the pension fund for their eventual benefit. Any self-employed person knows that he alone pays for his pension. Is it possible that inflationary pressures have partly arisen because employees have not been prepared to accept the reduction in current incomes consequent on increases both in the State pension benefits, particularly in 1974, and generally in occupational scheme benefit levels?

4.5. Suggestions for improvement

It would, I suggest, lead to a better understanding of pension scheme funding if only the employee’s contributions were eligible for tax relief, and not the employer’s. All schemes would become wholly contributory, and demonstrate clearly the concept of ‘deferred pay’. An appropriate level of benefits could then be determined that was acceptable to the employees. The employer might assist in arranging the scheme, but would clearly not be paying for it.

I would further and provocatively suggest that any pension scheme that did not then provide index-linked benefits should not receive Inland Revenue approval. Existing employees should not be able to reduce the real benefits being paid to pensioners. But whether these benefits were fixed at only say one-half of final salary rather than two-thirds would also be a choice that the employees could make.

There is, of course, such a trade-off to be made. Most employers in the private sector would claim that index-linked pensions are too expensive for them to provide. Partly this has arisen from a faulty presentation of pension fund accounts by actuaries. If ‘inflation adjusted’ pension fund accounts were prepared we should see that the failure to index pensions resulted in a hefty profit to the fund, that salary rises in accordance with inflation resulted in neither profit nor loss, and that the overwhelming source of loss was the failure of the
accumulated value of the assets to rise with inflation. Fixed money assets have hardly ever, recently, given a yield sufficient to compensate for inflation, and even though ordinary share dividends and property rents have almost kept up, the yield basis has changed to such an extent that market values have for some years seemed very depressed. It is deplorable that pension schemes have chosen to cut the real value of current pensions rather than cut the prospective future benefits, if contributions could not be increased.

4.6. The correct approach

Indeed, for some years the existence of high money interest rates and a lack of allowance for inflation may have led employers, no doubt with actuarial advice, to believe that the promised benefits could be provided with a lower contribution rate than is realistic.

This sort of approach is exemplified by a Faculty paper by Boden and Kingston (1979) and the discussion thereon, in which a clear understanding of how inflation affects pension schemes was not universally demonstrated. Whilst I would claim no expertise in the detailed considerations that affect modern pension fund costing, it is clear to me that any approach that makes an explicit assumption about price inflation, salary inflation or fixed interest money yields must be wrong in principle.

The correct approach has to be on the following lines: assume that all benefits are in fact increased according to a prices index, whether this increase is discretionary or guaranteed; assume that earnings on average increase at a slightly greater percentage than prices, say by 2% more; assume that real assets yield a small positive real yield relative to price inflation of perhaps 3%, or at the very worst of zero. In fact with ordinary share dividend yields at 6% one could arguably use a figure higher even than 3%. I now show the justification for this statement.

4.7. The real yield on ordinary shares

It is frequently said that real yields on investment in recent years have been negative, and even that this puts into question the whole concept of funding pension schemes. While obviously the debâcle of 1974 in the ordinary share market disappointed those who had invested in the bull market of 1972, it is not true that real yields on ordinary shares have generally been negative, either since 1974, or over a longer period spanning 1974.

I start with the share price and dividend index based on the former Actuaries and current F.T.–Actuaries 500 Share Index from 1930, as shown in Tables D1.3A and C of the Maturity Guarantees Working Party Report (1980), and extended to June 1980. The F.T.–Actuaries All Share Index would, in principle, be preferable, but there would be little difference in the results. I take June figures to correspond with the June figures I used for the Retail Prices Index in part 1.

Table 4.7 shows the share price index, implied dividend index, and ‘rolled-up index’, i.e. the share price index with gross dividends assumed to be reinvested at
Table 4.7. Actuaries and F.T.-Actuaries 500 Share Index, 30 June each year  
(All based on 100 in June 1930)

<table>
<thead>
<tr>
<th>Year</th>
<th>'Real' share price index</th>
<th>'Real' implied dividend index</th>
<th>'Real' rolled-up index</th>
<th>Dividend yield (%)</th>
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<tr>
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<td>100·0</td>
<td>100·0</td>
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<td>58·5</td>
<td>126·7</td>
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<td>169·9</td>
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<td>148·6</td>
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<td>1970</td>
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<td>792·9</td>
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Table 4.7. (Cont.)

<table>
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<tr>
<th>Year</th>
<th>'Real' share price index</th>
<th>'Real' implied dividend index</th>
<th>'Real' rolled-up index</th>
<th>Dividend yield (%)</th>
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<td>142.8</td>
<td>89.8</td>
<td>967.1</td>
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<td>1972</td>
<td>161.1</td>
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<td>1980</td>
<td>71.3</td>
<td>78.3</td>
<td>788.9</td>
<td>6.69</td>
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</tbody>
</table>

the end of each year, in each case divided by the Retail Prices Index to give a 'real' index, and then expressed relative to a base of 100 in June 1930. The quoted dividend yield (Table D1.3B of MGWPR) is also shown, on which the implied dividend is based.

The fundamental item is the real dividend. One would expect that dividends, which are based on company profits and are measured like them in money terms, would be reasonably constant in real terms, rising or falling with the level of trade, with the share of value added received by capital, and with the share of the return on capital taken by ordinary shareholders.

One can see in fact that this assumption of reasonable constancy is justified only in rather broad terms. Real dividends appear to have long runs either of growth or decline. From 1930 to 1933 they nearly halved, falling from 100 to 54.5; after a partial recovery to 78.0 in 1938 they fell again to 48.3 in 1941; then followed a long and fairly steady climb to a peak of 110.7 in 1965; the last 15 years have shown a fairly steady decline to 68.3 in 1978, followed by a modest recovery to 78.3 in 1980.

The 1980 level is close to the average for the period. A reasonable expected value for the future would also be close to this level; but how far away might real dividends drift upwards or downwards again? Over every 10-year period starting in the 1930s the change in real dividends was negative, with the worst fall being between 1930 and 1940, averaging −5.0% p.a. Over every 10-year period from 1940 to 1960 the change was positive, reaching as high as 4.9% p.a. from 1951 to 1961; since 1960 every 10-year period has again shown a negative change, by as much as −4.4% p.a. from 1965 to 1975.

Over no 20-year period, except for those starting in 1930 and 1931, has the negative change been worse than −8% p.a. (1957–77); but from 1930 to 1950 the change was −2.3% p.a. Such results are consistent with the lower 2½% forecast for 10 or 20 years ahead, using appropriate time-series models for this univariate series. The upper 97½% forecasts show positive values of comparable magnitude.

The overall return on a share held indefinitely depends of course on the initial yield as well as the growth rate of dividends. But with an initial yield of over 6½% gross a real growth rate of dividends as low as −4½% would still give a 2%
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positive real gross return; and if the real growth rate of dividends were even as good as zero the return of 6.4% would be very satisfactory; with extremely good luck the real return could be as high as 11%.

Ordinary shares are still seen on this basis to be a risky real investment. But I am inclined to think that a gilt-edged index-linked stock might need to offer around 4% to be satisfactorily competitive with ordinary shares for a gross fund.

Over any finite time period one must also take into account the capital value of the share as well as the dividend income. The 'real' share price index has fluctuated much more, and is now (at 71.3) nearer the lower end of its range of 44.7 in 1942 to 169.5 in 1968. But, as was shown in the Maturity Guarantees Working Party Report, prices have fluctuated around dividends, with the (prospective) yield tending always to return to mean level of around 5%.

The 'rolled-up' index shows the effect of compounding gross dividends received annually. The 'real' rolled-up index has shown a general positive growth over the whole 50 years. From 1930 to 1980 the gross real return was 4.2% p.a. Over every period longer than 14 years the return has been positive, with the 15-year return varying from -1.1% p.a. (1960–75) to 12.0% p.a. (1953–68).

Over the 14 years from 1960 to 1974 or from 1961 to 1975 the return was negative (-1.1% and -6.6% respectively), and from 1972 to 1980 the return was -4.4% p.a. However, for 5 of the last 6 years the real return was positive; indeed from 1974 to 1979 the real return was 10.6% p.a., and up to 1980 was 7.3% p.a. (Note that by taking June prices I have avoided the worst of the 1974 bear market.) Thus real returns have been comfortably positive in the very years that negative returns have been so much talked about.

Only for an investor who purchased in the years 1968–73 inclusive, or in 1979, has the real return up to 1980 been negative. And in every one of those earlier 6 years the (historic) dividend yield was below 5%, being below 4% in four of them. Is it too much like hindsight to suggest that investors at that time ought to have known better, and were carried away by too much optimism? But with yields now well over their historic norm the risk of substantial falls in share prices is surely much less.

An alternative, and more elaborate, approach would be to consider money dividends as dependent on inflation in a lagged way, by means of a time series 'transfer function'. I have not had time to complete my investigations in this direction, but preliminary calculations show that money dividends respond fully to a change in prices with a timelag of up to 10 years. Why the lag should be as long as this I cannot rationally explain, and I should prefer to confirm my calculations before publishing the results. A slow response time would however help to explain the long periods of upwards and downwards drift of real dividends, i.e. that money dividends take a long time to catch up with prices, but eventually do so fully.

4.8. Conclusion

These last investigations show that a real yield of 3% on ordinary shares is not
an unreasonable assumption. Presumably property would give a comparable yield. It is therefore appropriate to assess contribution rates for pension schemes that provide benefits wholly linked to salaries or to a Retail Prices Index using a real rate of interest of 3%, provided that all the investments are assumed to be in real assets. Fixed money investments have no actuarial justification in such a scheme; and, of course, index-linked securities, if they were available, would be entirely suitable.

Index-linked pensions are not an unreasonable imposition on the taxpayer, nor on private sector employers. They are what any reasonable employer thought he was arranging and every employee was expecting to receive. Index-linked public sector pensions have been described as 'an obscenity'. This was strong language for a speaker at the CBI 1980 conference to use about any financial arrangement, but it would have been more appropriate if he had described any pension that was not indexed in these terms. I hope the actuarial profession will start to assess pension schemes in a more realistic manner, and help to persuade employers and employees that fully indexed benefits (including, of course, deferred pensions for those who leave service) are not only reasonable but can also be afforded, even without index-linked government stock.

This, at least, for continuing self-administered pension funds. Small firms, and self-employed individuals, require to make use of insured schemes in order to spread the mortality risk. There would remain some investment risk, even with a wholly equity, with profits, type of contract. It is for this type of scheme that index-linked government stock is essential. With such stock we can begin to put our whole financial system on to sound modern lines that recognize what I started with, that the future course of inflation is uncertain.

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ABSTRACT OF THE DISCUSSION

The author (presenting the paper): Mr President, about a year ago when, in your previous capacity as Chairman of the Sessional Meetings Committee, you asked me whether I would write a paper on index-linking and I agreed to do so, we both thought that the subject might be topical, but neither of us expected that it would be so particularly topical as it turns out to be tonight.

I should explain really for the benefit of those reading the printed discussion in future, for hardly anyone here will need telling, that in his budget speech on 10 March, the Chancellor of the Exchequer, Sir Geoffrey Howe, announced "an important extension of the structure of Government borrowing, by introducing an indexed gilt-edged security", which would "be sold to pension funds, and to life insurance companies and friendly societies in respect of their U.K. pension business". Later that day the Bank of England gave details of the first such stock, £1,000 m of 2% index-linked Treasury 1996, to be issued by tender on 27 March, four days from now. Income and capital are linked to the value of the Retail Prices Index in the month eight months prior to payment, so that the £ amount of each interest payment should be known at the beginning of the six months in respect of which the interest is due, and in the last six months of the stock it will become fixed wholly in money terms. Indexing, however, is based on the Retail Prices Index for July 1980, so the stock is indexed over its full life, although eight months in arrears.

Fund Managers are now wondering whether or not to lender for this stock, and if so, at what price. Some reports suggest that it may be fully subscribed at a price well above par.

Naturally, I welcome this new stock with open arms. I am sure it will sell, but I hope that the price is not too high. I want to see many more such stocks issued. I should have thought that the Government could easily raise half or more of its new borrowing in this form over the next two or three years, or even more than all of its new borrowing if it bought in some existing fixed interest stock. However, I personally doubt whether this quantity of stock could be sold at a yield much below 2% real, and I would expect the yield to settle down somewhere between 2% and 3%. In that case, the price of this first issue may drop, at least in real terms, but the price may not drop in pound terms. As fund managers all know this, they may refrain from tendering, on the grounds that they will get as much as they want later and cheaper. Other newspaper reports suggest that the stock will not even be fully subscribed.

While this game of bluff is quite proper in an established market, I think there are dangers in this case where the ground rules are not yet clear. I would strongly urge that any eligible institution should consider how much index-linked stock it might like in its portfolio—not just from this issue—and at what price, and then bid for that. The issue then would probably be heavily oversubscribed at suitably low prices, but from the schedule of total bids at each price the Bank of England and the Treasury would get some idea of the quantity of index-linked stock which could be sold and at what price, and this would be a useful guide for future issues.

May I now turn to the paper. Part 1, of course, is still valid and the conclusion is clear. Future inflation remains just as uncertain.

The Government's acceptance of the principle of index-linked stock, even if only for pensions business, makes some of the argument in Part 2 moribund. Those who regret or even deplore this new issue may want to present the arguments against and tell us of the dangers created by its introduction. By restricting the new stock to gross funds, the Government has avoided the problems of taxation, for the time being at least. But the problems of company securities and house purchase loans are not yet solved, and pressure may well build up for index-linked stocks to be issued to all. Interest rates have been reduced to around 2% 'at a stroke', although these lower interest rates are not really available to borrowers other than the Government, nor to lenders other than eligible holders. When the tax implications have been sorted out, extensions, I hope, will follow.

Part 3 is more relevant than before, at least for all the pensions type of policies. Internal funds linked to the index-linked stocks have already been announced. Other types of policy may follow, when it can be seen that sufficient stock, of a sufficient range of terms, both much longer and shorter than the present 15-year issue, will be available. Traditional actuarial techniques come back into their own in this new situation.
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The report of the Scott Committee, to which I refer at the beginning of Part 4, was published in February, and recommended that index-linked stocks, if made available to pension funds, would allow a market value to be placed on guaranteed index-linked pensions. We shall certainly be able to do this now. Whether pension funds in the private sector will feel able to give discretionarily or to guarantee index-linked pensions to pensioners is a matter for each fund and its advisers to consider; but at least the cost can be assessed more clearly. While I said a moment ago that the rate of interest for borrowing had been reduced 'at a stroke', it is also possible—and this depends on what assumptions actuaries have made—that the real rate of interest suitable for valuing pension funds has been increased 'at a stroke'. If so, it will appear more easily possible to pay index-linked pensions without increasing contribution rates, although I quite appreciate that in the present economic climate, increased contributions are the last thing many companies are thinking about.

Other consequences of the new stocks may follow. For example, if pension schemes can fund for indexed pensions then the buy-back premiums for guaranteed minimum pension may be superfluous. At any rate the market indicators on which these premiums are based might, at a suitable opportunity, be revised onto an index-linked basis. There are those who will say: Instead of all this stuff about index-linking, should we not just stop inflation? I fully agree, and if anyone can explain how I personally, or any other actuary, or any pension fund, insurance company, government stockholder or pensioner can do anything to stop inflation I shall be delighted to do it or pass the message to those who can. In a small way, I believe that index-linked stocks may help, making it easier for the government to finance its borrowing without increasing the money supply, and without increasing fixed money rates of interest yet further. Any economists here will be able to say whether this is likely or not, but time will not necessarily tell. Whichever way inflation moves we shall not be able to say whether it was because of, or in spite of, the existence of index-linked stocks.

Mr D. P. Hager (opening the discussion): Apart from sharp rises in individual years, there have been long periods of fairly stable prices, at least until recent times, and it is not surprising that our financial contracts are mainly based in money terms, and as described in § 1.6, our business practices have been dominated by attitudes of those brought up in times of stable prices. Even in the 1950s and 1960s we could cope with low, single figure inflation. If you gave up the right to consume resources and lent some money to another person, you could still expect to receive a rate of return which enabled you to buy the same set of resources at a later date, plus some extra compensation. In other words, you could achieve a real rate of return.

Then came the late 1960s and 1970s with a rapid explosion of prices. Many financial arrangements which were adequate in previous years were no longer suitable to our new political and economic environment. The principle that a lender ought to receive a real rate of return has been eroded, and, even after a decade of rapid inflation, our system still thinks largely in monetary terms. Someone my age has only really known an inflationary environment, and finds it difficult to understand why we have not taken greater steps to make allowance for inflation in financial contracts. It is perhaps somewhat sad that we are discussing this paper in 1981 rather than several years ago.

Successive governments have tried to conquer the evils of inflation, but to date show no signs of being able to do so. Success in permanently reducing inflation to a much lower level would bring about substantial benefits to all sections of the community, but until the event takes place, society must learn to live with inflation. Indeed, single figure inflation is now seen as a desirable goal, and if it is attained, I am sure there will be other pressures on government, which will mean that long-term inflation of, say, 10% will be tolerated. So I do not think that the problem will go away.

Unfortunately society has come to accept some grossly inequitable practices. For example, building society savers receive an inadequate return because mortgage rates are kept low. We heard complaints about Minimum Lending Rate at 17% when inflation was running at a much higher level. There are massive subsidies from one sector of society to another which are not often fully appreciated. This leads to an inefficient allocation of resources, and some of our economic ills may stem from the tolerance of practices which would have been possible if more equitable arrangements had been in force. Would successive governments spend more than they receive if they had to pay a reasonable price for borrowing the excess?

However, part of the problem is understanding that people do not generally appreciate the
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devastating effect of inflation on monetary items, and the power of compound interest over just a few years. The author says he cannot conceive an individual who wants a fixed money asset rather than a real asset. In my limited experience, individuals clearly do not act rationally. In a pension scheme you offer the choice of added years or fixed money pension in an additional voluntary contribution arrangement. There are still many who prefer the fixed pension. It is difficult to suggest ways to overcome the problem. I am sure that if the effects of inflation were more widely understood, society would find many current practices totally unacceptable. For example, if the redistribution of wealth is deemed to be desirable by society, is it not better to take specific action rather than let inflation do the job in an arbitrary way?

There have been fears about indexation. It is uncertain, and the potentially unlimited future cost is one of the main problems. Part of this difficulty is due to the unstable nature of recent inflation, lack of real rates of return on conventional assets, and half-hearted attempts by successive governments to control inflation. It is very difficult to believe that the Government will reduce inflation if it is borrowing long-term with 15½% coupon. However, following the recent issue of index-linked stock, I shall have much more confidence that inflation will be controlled. This is only possible provided that the Government makes adequate allowance for public sector borrowing requirements for the cost of the change in capital value on redemption following changes in the Retail Prices Index. If industry was much more profitable and real rates of return were available on industrial investment, even with inflation, much of the fear of indexation, I believe, would have subsided. Really indexation should not be a great burden providing society accepts that those who forego the consumption of resources and lend money, should at least be able to purchase those resources at a later date. Another criticism of indexation is the knock-on effect. This argument works on the basis that if most things are indexed, then some sectors will secure agreement at so many per cent above the rate of change in the index. This may lead to an inflationary spiral, but perhaps we shall be looking at a fairer system than the present one. After all, it may be possible to have a stable economy with inflation even around the 20% level.

I should now like to turn to the new index-linked gilt. I can only speculate on the effects of its issue on the financial system; but I believe it will lead to a fundamental change in the total investment scene, and in particular in pension fund investment philosophy. Fund managers can now relate to an asset in real terms and, hopefully, this will lead to more consideration of real rather than money returns. The issue, however, is limited in size, maturity and type of investor; hence it is only a small step in the right direction. We have a long way to go, but many institutions can now consider index-linked contracts of many types.

Before index-linked gilts, the only index-linked savings contracts I have seen have usually been accompanied by what I would call a 'get-out' clause which suspends indexation if things get too tough. Whilst actuaries can appreciate the need for such a clause, the public will not, I believe, understand its significance, and its use is likely at a time when indexation is most needed from the policyholder's viewpoint. Even with index-linked issues, 'get-out' clauses may be needed. However, I think we have a moral obligation to ensure that we sell the policyholder what he thinks he has bought.

Now I would like to comment on index-linked pensions. If we are to index pensions which are not now indexed, we shall be increasing the benefits paid. Without the allocation of more resources from industry and commerce to pension funds, the increased benefits to pensioners have to come from decreasing other benefits from the funds.

I have argued on other occasions about the inequity of final salary-type pension schemes which favour employees who are with their firms through the final phase of their working lives. It all comes back to the allocation of a certain level of resources, and it is time that the private sector found ways to reduce the scales of benefit to active pensioners so that deferred pensioners receive a larger slice of the cake. We need to move to a system where, for employees who earn the same salary, the call on future resources which they are granted should be proportional to the length of their term of employment. Similarly, of course, this should be proportional to their salaries in each year for employees of similar durations of employment. Final salary pension schemes involve a great deal of cross subsidy and are examples of a semi-indexed linked system, that is, indexation is given to employees who are still in service, in line with their own salaries, and generally there is no indexation for others which, perhaps, is the worst of all worlds.

Index-linking is not a panacea for all the problems of inflation, but I would submit that a greater
use of indexation would lead to a fairer society. Indexation would bring many problems. For example, what index do we use? How do we get rid of current legislation which defines everything in money terms? Imagine the dilemma of a future policyholder having to choose between a money-based contract of, say, a fixed £2,000 in ten years time, or, alternatively, a sum of £500 indexed over a ten year period. These problems, of course, are not insuperable.

It is time for a change. I hope that those of you who wish to preserve the status quo will point out viable alternatives to the proposals before you.

Mr D. H. Newton: I would like to join with the opener in welcoming this paper, and I agree wholeheartedly with the author that, due to the unpredictable nature of inflation, index-linked contracts are desirable. I think this is the major argument in favour of introducing index-linking; in particular to protect those in retirement who no longer have real earning power available to them. It is in the possibility that some equality may take place between the private and public sectors, that I welcome the Government’s first issue of index-linked stock. It is more along these lines than in any other way that index-linked investments will allow us to have index-linked pensions.

I am not so convinced about the author’s arguments concerning PSBR. Certainly PSBR will be lower if the Government continues to introduce the index-linked gilts which we have recently seen; but so also will be the flow of funds into pension fund and insurance companies. The present Government wishes to cut PSBR, to enable more investment opportunities in the private sector. This will not occur if the Government only achieves its aims by reducing institutional cash flow.

There are doubts whether or not an index-linked bond of the type that has been issued will not encourage the Government in fact to overspend, since borrowing costs in the earlier years are lower. I think there is a great danger here. I, therefore, would be more in favour of the type of stock where the capital does not increase in line with inflation. Each year the income will not only give a real return, but also give back what has been lost through inflation in the last year. So, for example, on looking at it on an annual basis, if inflation has been 10% and the coupon is 2%, the Government would pay out to bondholders £12 per £100. I realize there are problems if prices fall, and further difficulties with taxation. However, I feel this method is preferable as the Government will quickly notice the cost of inflation, and it will not be deferred for fifteen years. It will also add to the argument that index-linked stocks would help the Government in its incentive to fight inflation. I have just touched on one of the points which make index-linked gilts attractive, particularly to the net investor. Why else has the Government been fairly successful at selling ‘Granny’ bonds at times of falling inflation, when the gross returns elsewhere, have been better? The answer is that they are not taxed. Inevitably, if such investments were available it would make considerable difference to the real return if they were not taxed.

I should now like to come to the author’s provocative comment, as I am sure it was meant to be, that an index-linked gilt should yield roughly 4% to compete with equities. I do not think we should look at it by comparison with equities alone. This is a new form of investment and should be compared against all other forms of investment. Here I feel you should have a lower yield for pension funds, but for fixed interest stocks a higher return will be required. This will also be the case for property, where you have problems of rent reviews, management expenses and, above all, marketability. So given that the real return has to be somewhat lower than that—I think the guarantee is certainly worth 1%—I would favour the lower end of the author’s opening remarks where he said 2–3% was the level at which he would expect it to settle down.

Mr A. J. Gunson: In reading this paper, as an investment manager I can see many advantages in indexation, but as an inhabitant of this country and looking at the national scene, I have far more reservations about it. Although the author says that the issue of index-linked Government stocks, fully marketable and as a major part of new Government borrowing, would be beneficial to the Government, taxpayers and investors, I believe that is only a true statement in the short-term, because, in the long-term, no one knows what the ultimate effect will be. It is more than likely that this indexation on a wide scale could prove a politician’s dream so that a spendthrift Government in some way or other increases the amount of inflation in the economy, and just puts off the day of reckoning to another time. This, I think, is the danger with widespread indexation. The only circumstances
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where it is a good thing is where there is a national commitment to reduce inflation, and if that national commitment exists, the issue of index stocks could well make the transition from a high inflation era to a low inflation era that much easier. If there is no continuing national commitment to reduce inflation, all that would happen would be that indexation would make the inflationary situation fairer to different sections of society, thereby removing much of the incentive for the Government to reduce inflation. Unlike the author, I hold that governments can reduce inflation, and we should not therefore encourage them to issue instruments which make it easier for them to allow inflation to continue.

Inflation is not inevitable. It is the product of government overspending and trade union pressure. If indexation throughout the economy takes place, we shall have economic rigidities, because what trade union leader will happily settle for an award which is less than the indexed wage award that is generally effective throughout the economy.

I feel that the dangers are much larger than the author has suggested. It is sad to say, but I believe that some measure of discomfort is necessary if inflation is to be tackled, and merely to remove that discomfort removes much of the incentive for dealing with inflation. Indexation only alters the risk, as it removes some of the risk from investment, and transfers it to future taxpayers. That, surely, cannot be a desirable thing unless one assumes that inflation will continue at current levels for many years to come. There is no historical evidence to show that inflation is endemic over the long-term, and I would prefer to believe that, despite the convenience to us, as investors and as investment managers, of having indexation, from the national point of view, it cannot be a good thing to encourage widespread indexation. Although it might create greater equity in this country, I think it would be at the cost of industrial efficiency, because the indexed stock is the ultimate in the Government's armoury for obtaining funds in the market place at the expense of the private sector. What industrialists can happily offer an indexed stock? In the past, governments have obtained all the money they needed by raising the level of interest rates so that industry could not afford to compete for long-term fixed-interest funds. Now, with an indexed stock the same result would be achieved, maybe to an even greater extent, because the bulk of industry probably could not afford to compete with an indexed stock. Certainly ordinary shares would have to give a better performance than they have over the last twenty years if they are to be regarded as a satisfactory alternative to indexation.

Mr A. P. Limb: The government, perhaps stimulated by the Scott Committee, but, one suspects, decided before that report was published, has stolen a march on this evening's debate by announcing the issue of one index-linked stock. Plainly one stock is of limited use to the life assurance industry, so one must expect that it has been issued with a view to ascertaining what terms the market will accept. It is also expected to be followed by a range of other similar stocks.

There is no doubt in my mind that if this occurs, the life assurance industry will undoubtedly exploit the possibilities of such stocks to issue index-linked immediate annuities, to alter the design of group pension contracts, to provide for individual retirement contracts and to hold as an investment. There will, in that case, be immense pressure from the private sector to provide for pensioners the same valuable index-linked benefits as are enjoyed by the vast bulk of employees in the public sector. Furthermore, there will also be considerable surprise and chagrin when the cost of doing this becomes evident, leading to repercussions in a number of areas, possibly in some of those areas discussed in the Scott Report.

I would, however, like to comment, perhaps vainly and in support of the previous speaker, on the undesirability of proliferating index-linked securities, while admitting that if they are so proliferated they will undoubtedly be used. I believe that at the time long-term debt was first issued by the Government in any quantity—which I think was in the last century, but I am not sure—there were cries accusing the Government of the day of irresponsibility in putting off the evil day when that debt would have to be repaid. We now have a situation where a very substantial part of the public-sector borrowing requirement is required to re-finance existing debt. It must be extremely tempting for the authorities to envisage the possibility of cutting the public-sector borrowing requirement, either very substantially in the short-term by means of conversion of existing high coupon stocks, or gradually by replacing them as they mature with index-linked securities. Unless steady funding is employed to build up a redemption fund for linked securities, then borrowers, including the Government,
are surely living in a fool's paradise, and one of a highly inflationary nature. We can only hope, although experience suggests that such hopes may be futile, that careful husbandry will prevail when the management of index related debt becomes a major issue. If the private sector uses index related debt to provide for inflation-proofed pensions, then I fear that unless inflation is kept down to a low figure, there will be a refusal on the part of the working population to forego consumption on the scale that will be necessary to protect the retired section of the population. I do not believe that it will, in the long run, be found politically practical to make such a transfer of resources to the retired section of the population as would be necessary if the whole of that section were to enjoy inflation protected incomes. If I am right, this might lead to a demand for index-linked bonds to be available to the population generally, no doubt with the consequences indicated by the author. This seems to me, however, to be an untenable situation. It is impossible for the whole population of a trading nation such as ourselves to protect itself against the effects of inflation. It appears to be akin to an economy surviving by the process of taking in one another's washing. As the author himself suggests, where all factor incomes are inflation protected, there is an inherent instability in the currency, and that, for a trading nation like ours, is surely a grossly undesirable situation towards which to move.

The author suggests that the issue of such bonds is not in itself inflationary, and earlier speakers have suggested that they would provide a discipline to the government of the day. In agreement with the previous speaker, I would submit that if they are generally available, then the motivation, which some now feel, to seek a control of inflation will inevitably be less, and this is bound to lead to inflationary pressures and to instability. I fear that my plea may be in vain, but I urge that the consequences of the widespread issue of index-linked bonds be reconsidered and that the present experiment remain no more than an historical curiosity.

Finally, I would like to make a brief comment on the first section of the paper. The conclusion of that section is that it is difficult to foresee the progress of inflation, and I find it intriguing that the author should reach that conclusion, with which I wholeheartedly agree. At the same time, I believe in subscribing to the view that it is reasonable to produce a model which can be used to simulate Stock Exchange prices in the future for finding reserves for maturity guarantees. But I suspect that any author with the extraordinary powers of foretelling the future as our present author has displayed by producing such an uncannily topical paper, can probably foresee the rate of inflation, and I hope to persuade him to tell me about it one day.

Mr. K. G. Smith: I propose to confine my comments to Part 4 of the paper, namely, index-linking and pension schemes, and to some points on which I have had personal experience.

The first is the need for index-linking. The paper emphasizes the need, obvious to those not blinded by the funding problems for pension schemes to provide a maintained standard and not a diminishing one. This has already been accepted in respect of pension benefits prior to retirement by linking them to final salary. It is unquestioned in respect of State national insurance benefits which are statutorily linked to prices; it is universal in public-sector pensions arrangements; and it is widely practised in continental Europe. Private occupational pension schemes purport, however, to find it impracticable with the result that many employers are constantly pressed to make charitable ad hoc increases to pensions instead of providing proper entitlement to former employees.

Indeed, this is one of the human features of the present pension structure which I find least attractive. It is distressing that pensioners have to write begging letters to their former employers to slow down the rate at which they are irresistibly being impoverished; likewise, it is unfortunate for the employer to be placed in the position of having to choose between protecting his former employees, or remunerating present employees and shareholders. We should all ensure that our funding arrangements make proper provision at the time when the pensions liability is incurred, as closely as can be assessed in advance, for the payment of benefits in real terms. As might be expected, the present system leads to great bitterness between the 'haves' of the public sector and of wealthier parts of the private sector, and the 'have nots' of thinly funded schemes elsewhere.

As to choice of index, I support the author's advocacy of the Retail Prices Index as a suitable index for pensioners. When index-linking has become universal will be time enough to consider whether a faster rising earnings index might be preferable. Indeed, to avoid the aggravation of those rare occasional years when real earned incomes fall in terms of prices, I would be prepared to settle for the
aggregated increase since commencement of pension of either earnings index or Retail Prices Index, whichever is the less.

With regard to the amount of pension, in his broad calculations in § 4.3, the author perpetuates the myth that a lot of schemes give a pension which is normally two-thirds of final earnings. A sample of a year's normal retirements in a typical large pension scheme showed on average of only twenty years pensionable service on normal retirement. The idea of a cosy forty or more years pensionable service is realized only by a small decreasing minority, particularly in the present circumstances of recession, and perhaps we do not appreciate it in this Hall because many are probably enjoying a rather longer service. Until we solve the problem of pension preservation and transferability, it is a travesty of the facts to assume that the majority will ever enjoy a two-thirds pension. Furthermore, the average amounts of pensions are reduced by the anomalous taxation treatment given to commutation for lump sum benefits permissible up to one and a half times final salary. Rightly or wrongly, few pensioners can resist the lure of a substantial cash sum whatever the commutation rate. I personally would be glad to see the tax-free lump sum option phased out, though I appreciate that this might give rise to political difficulties. The net effect of both these factors—average pensionable service and commutation—is that the average occupational pension is only a fraction of the State single person's retirement pension. A typical figure would be one-third overall, and perhaps one-half in a few large schemes of which I have had experience. I see no case therefore for reducing current accrual rates.

As to sharing the cost, when the author comes to deal with actuarial contribution rate, § 4.4, he queries whether contribution rates of the order of 17–21% of salary are acceptable to employees. In this connection my own experience, negotiating on behalf of two recent employers, one in the public sector and one in the private sector, is that of all possible pension scheme improvements, the one to which employees and their trade unions attach the highest priority is the protection of purchasing power of their pensions when payable. In both these industries, the employees voluntarily undertook to pay substantial increases in their own contributions—in one case an increase of one-fifth and in the other case of one-third—primarily to ensure a better degree of pension protection. Furthermore, in both cases, they appreciated that the employer could not sign a blank cheque and, therefore, if inflation ran away, there could be no unconditional guarantee of solvency. The members' representatives accepted the principle of a fixed ratio between the employees' contributions and the employer's contributions, and in both cases the ratio was one to two. In one case, the joint level was fixed at 18%, 6% from the members and 12% from the employers, and in the other, 24%, 8% from the members and 16% from the employers, which provides an answer to the author's question of whether such rates are acceptable to employees.

With regard to suggestions for improvement, I suspect with his tongue in his cheek, the author suggests that the whole cost of pensions should be met by the employee since it represents his deferred pay. One difficulty about this would be that some employees would 'contract out' altogether, perhaps with the expectation of a short life, emigration, or a win on the pools. The present system does at least ensure a level of minimum provision for eligible employees thus protecting an employer against ex post facto claims for subsistence. In many cases, possible options for additional voluntary contributions provide the sort of alternative to employees which the author advocates. One cannot however dispute the last paragraph of § 4.5 in that pension fund accounts and valuations have failed to show the way in which increased income from the reserves held for current pensioners has been dissipated.

I would wholeheartedly support the author's conclusions that index-linked pensions are not an unreasonable imposition on the taxpayer, nor on private-sector employers. Adequate safeguards may need to be inserted to ensure that employees or, for that matter, employees, are protected against disaster in the event of hyper-inflation, but such an event would cause the termination of present funded occupational pension schemes as it did in France. Pension funds can be, and need to be, adapted to cope with widely varying rates of inflation likely to continue for the future. Even as actuaries, we should remember that pension funding was made for man, and not man for pension funding.

Mr M. J. R. Kelly (a visitor): It is often thought that only the Government can provide inflation proofing, but, in my opinion, for the capital markets to work successfully, investors must be able to
obtain a real return on their capital. It follows that the consumers of capital, the borrowers, must pay a real cost for their money. In the past, this equation has worked well enough with deposit type investments, the Bank Rate, the building society lending rate and other indicators, all being comfortably in excess of inflation. But, over the last twenty-five years, all those borrowing money paid a rate roughly equivalent to 3% over bank base or minimum lending rate. They all paid positive interest for their loans in all but two years of the last twenty-five years. However, during the years 1973-76 political forces were responsible for holding down interest rates below the inflation rate. This caused inevitable major economic distortions in our financial systems and for a time negative returns became prevalent.

Before 1970 inflation was not an important issue. Financial institutions used to link lending and investment rates to base rates which were all mysteriously linked to the Bank Rate which had little relation to the Retail Prices Index. But this system could not cope with double figure interest rates and inflation rates such as we experienced in the mid-1970s. Building society borrowers were suddenly realizing that their so-called ‘level’ repayment mortgage was far from level. There have been 17 changes since 1973, some involving increases well above inflation. Investors were beginning to realize their return was less than ‘real’, and began pulling out with a consequent shortage of mortgage funds. Banks were still able to lend at interest rates above inflation, although there was still no direct link to the Retail Prices Index.

About twelve months ago, it was possible to obtain an index-linked loan where the base rate was linked simply to the Retail Prices Index, as opposed to the Minimum Lending Rate. At the same time, the monthly repayments were arranged to start off low, but to remain constant in real terms throughout the period of the mortgage. Contrary to many expectations, the response to the scheme has been overwhelming and the quality of applicants high. The attraction was in the initial low repayments, where the borrower was able to take advantage by borrowing a great deal more money. These initial repayments were about half the size of those for the conventional so-called level loan. Businesses, taking advantage of this loan, discovered that what they thought they were squealing about, which was high interest rates, did not apply. The cash-flow repayments, and the indexed-linked loan with a constant stable cash-flow pattern, was just what they were looking for. At last, it is possible to obtain a realistic mortgage scheme which offers larger loans independent of inflationary pressure, and will never involve the borrower in any future greater burden, in real terms, than the initial repayments.

The investor can now confidently achieve a real return with the minimum amount of risk by investing in such a loan. As the mortgage is a capital repayment type, the real equity will always increase, because the real debt decreases, and the return to the mortgage investor does not depend on the growth rate of the underlying property.

Traditionally, investors have assumed that the principal method of beating inflation is to invest in real assets, such as property and equities, but to accept the inevitable risks. Deposits were considered much safer, but were ineffective in the long-term. Now, with the concept of index-linked mortgages and index-linked loans, investors can invest in an inflation-beating asset, but with ‘deposit type’ security.

Mr G. Lindey, F.F.A.: I know the author of today’s paper well and, indeed, we both hail from Edinburgh, but until reading this paper, I was not aware that he was the actuarial embodiment of those other Edinburgh natives Dr Jekyll and Mr Hyde. The evil Mr Hyde wrote Part I. With great mathematical elegance, the author has demonstrated that it is impossible to forecast future price trends from those of the past 320 years, even if subdivided into periods of 254 years, 84 years and 24 years. I must say that when I arrived at this negative conclusion, I heaved a sigh of relief, because the opposite result would have set mathematics back at least a century. Indeed, we should have had to set alongside Gödel’s “Theorem of the Incompleteness of Arithmetic”, the author’s “Proof of the Irrelevance of Mathematics”.

So much for the evil Mr Hyde. At the beginning of Part 2, the good Dr Jekyll tells us what ‘wise’ men know already, that we cannot forecast what the rate of inflation will be over a future period. The fact is that we cannot, we know that we cannot, and the author has managed to prove to his own and our satisfaction that we cannot, predict future rates of inflation. Why does this matter? In the
investment world, there are large areas of unpredictables and uncertainties. The crucial factor which
differentiates inflation from the rest is that this is the only unpredictable variable which Governments
can and do manipulate for their gain, that is, at the expense of the lender. By borrowing fixed money
and debasing the currency, Governments incur what the author terms a CCA gain, and he is quite
correct. Hence the merit of indexed bonds as a discipline. I have heard it said generally and in this
profession, that, by issuing indexed bonds, the Government is institutionalizing inflation. This,
however, is no more true than the assertion that by having roads the Government is institutionalizing
traffic accidents. The proposition, that investors should have the opportunity to protect themselves
against the ravages of inflation, appears to me to be unassailable, and the author is to be
congratulated for his propagandizing in this matter.

There are a number of areas where I would disagree with the author, and apart from the choice of
index, where I have some doubts, a key point is the fact that it seems to me quite inequitable that
discontinuities in the savings function, as it were, should be tolerated. For example, ‘Granny bonds’
should be permitted to ‘grannies’ of both sexes and of any age. Index-linked bonds should not, in any
circumstances, be restricted simply to pension funds. If they are so restricted, it seems to me to be
bureaucratic nonsense to deduct tax at source from the coupons as is the case with this new bond.
Furthermore, it is not true that Governments cannot issue equities, as examination of The
Economist’s suggestion for GNP equities has made quite clear in the past. In addition, I believe that in
§ 2.6 the author has confused cash flow considerations with CCA profitability, and it is the former,
cash flow, which is probably of greater importance to monetarists.

One other point which has been touched on this evening is the ‘crowding out’ syndrome. Very
revealingly, in § 2.12, the author refers to the effect of diverting personal savings, and there is a grave
danger that the private sector, which has a hard enough time competing with Government borrowing
at present, will find it ruinous to compete for index-linked funds. However, investors and borrowers
in all financial areas should be allowed to index-link assets and liabilities to take account of this. The
equation in § 2.10(n) seems to me to be irrelevant. Let the market—all markets—choose! On the
matter of choice, we now have a bond. Despite the arbitrary discontinuity of eligibility in restricting
this security to pension funds, we already have an anomalous situation in which the self-employed,
using tax deductions, will see this as a cheap form of ‘Granny bond’. On this basis, they should be
prepared to pay up to a very high price, whereas conventional pension funds will be tempted at such a
level at their peril. A real return, relative to prices of the order of 2½-3%, should be sought. Employers
should be aware that if a real return of 1% relative to prices is used, then the assumption underlying
their costing will be unsound.

Finally, the author states in § 4.6 that “any approach that makes an explicit assumption about price
inflation, salary inflation or fixed interest money yields must be wrong in principle”. I would suggest
that this statement is quite untrue. Such an approach involves risk and the potential return must be
commensurate with the risk, but it is not wrong. By issuing this bond when inflation is falling, possibly
temporarily, the Chancellor has put this assertion to the test. We shall see!

Mr D. Gilling-Smith (a visitor): Like the author and Samuel Brittan of the Financial Times, I have
been a keen advocate of index-linked stock, but I do have mixed feelings about what is being offered. I
argued the case in the Financial Times some weeks ago for a 3% real rate of return to be consistent
with the Government Actuary’s assumptions used in the costing of public-sector pensions, and also
for consistency with the Inland Revenue’s effective limitation on the advance funding for
post-retirement increases by private-sector companies funding for maximum approvable benefits. I
would have preferred a more restricted stock that could be bought and sold at pre-determined prices,
such as National Savings certificates with a flow of future issues enabling insurance companies to
issue index-linked annuities to the trustees of pension funds.

One point on which I disagree strongly with the author is his suggestion that tax relief on pension
funds should be restricted to employee’s contributions. Being familiar with schemes for controlling
directors, where one might have employer contribution levels in excess of 100% of salary, this seems
to be a bit of a problem unless the 15% limit is removed.

The author has looked a little deeper into the past history of inflation. He goes back to Charles II. I
should like to suggest that people look a little further back—into the decline and fall of the Roman
Empire in the fourth century A.D., because the late Professor A. H. M. Jones, who produced a book on the later Roman Empire, *The Roman Economy*, did look into the way in which run-away inflation was achieved. The Romans discovered the art of simply punching higher numbers on to copper coins almost in the way in which we can print higher numbers on to pieces of paper we call money. One interesting parallel between the declining Roman Empire and our present situation with inflation is that whenever a strong person succeeded in making a determined effort to restore the stability of the currency, he would antagonize so many people who were doing quite nicely out of inflation that they would join forces to overthrow him. Instead of being grateful to the present Government for bringing inflation down from about 20% to about 10%, and giving us freedom from exchange control, vast numbers of ungrateful citizens argue about other lesser causes such as unemployment. Unemployment may be one of the only ways in which we are going to bring down inflation in the long-term.

Although there is a solution proposed for pension funds, problems arise for the private investor in that the combination of high inflation and tax in the U.K. makes it virtually impossible for private investors to get a real rate of return. A person paying only 30% marginal rate of tax and obtaining a 12% yield in the context of 10% inflation is, in fact, getting 9.1% net, an effective yield of almost minus 1%. He would be better advised to put the money into something like gold coins, diamonds or whatever, where he can get up to £3,000 a year tax-free capital gain.

One of the reasons why Great Britain became a major world economic power was that it created the climate for the individual. This gave him confidence in his ability to get a real return on his money, as opposed to putting it into valuable objects and burying them.

One possible solution would be to index the tax threshold of private investors, so that they would only pay tax on interest or dividends that exceed the rate of inflation. In the example given for 12% yield with 10% inflation, one would only pay tax on the 2%. As private investors cannot afford to wait for such tax reforms, the only answer that I can see is to put one’s money into the equivalent of gilts in the currency with the lowest rate of expected inflation, say Swiss Franc securities. The real rate of return is substantially higher than in the U.K. and the risk of capital loss in the event of run-away inflation in the U.K. is avoided.

The most important thing is that the Government has been given an incentive to reduce inflation, and this is what the author brings out in his example of the Government, on a 15% inflation rate, making £2 billion ‘profits’ on its quoted PSBR. In the absence of such incentive, there is a temptation for governments to pay lip-service to the objective of a stable currency, whilst continuing to profit at our expense by debasing the currency at an ever increasing rate.

I was amused to find Mr Layborn, that grand old man of pensions in Great Britain, criticizing the concept of index-linking in the columns of the *Financial Times*. I felt that in his time he had attacked final salary pensions and he had attacked contracting out of the Boyd-Carpenter scheme when it was first introduced. When he attacked index-linked bonds, it was the best sign that it was going to be accepted, as indeed it was in the March 1981 budget.

**Mr J. M. Brew:** The timing of the paper is more impeccable than many people realize. Furthermore, the author is going to start us off on a new method of thinking about investment.

I am slightly depressed, not at the contributions this evening, but at the level of discussion in the press, and in the investment community generally, about the proposition of what we are going to do with the index-linked bond. The line appears to be that it is expected to have many subscribers who are unenthusiastic, and that they will be subject to criticism on the lines that every fund should have some. This is a very frequently repeated argument in the last few days. Are we seriously arguing that our perception of the trade off between risk and return is so confused that managers will go for the safe return at almost any price? Actually this is the main thing we pay them not to do. Mr Pegler would be horrified at some of the comments there have been to the effect that since this gives safety, it is worth almost any price.

So there is likely to be a major change in the basis of our strategic investment thinking which, as an earlier speaker said, will in every sense of the word be realistic. I think we shall have, as it were, a sort of tool kit, and the questions will be much easier to answer than is generally appreciated. The investment manager will merely have to put down the real return he expects to get on an index-linked bond. I know it is somewhat complicated because of the time lag, but the difference is not significant.
He will then look at cash, which, I think, is a widely despised hedge against inflation. Interest rates tend to go up when inflation is high. I do not think you will beat inflation with cash, but you will not do too badly.

The next best in my book would be property, followed by equities and then gilt-edged stocks, and I think every investment committee should have before it three numbers: the expected rate of return, the sort of high-yield number and the low-yield number, so that the band in the middle has an even money chance of being achieved with a quarter either side. It seems to me that this would concentrate our minds in the way they ought to have been concentrated before, and the actual existence of a practical alternative will do this for us.

One of the most interesting parts of the paper was §2.6 onwards about the position from the Government's point of view. In a published document which will be remembered for years the author has to be careful what he says, but one should never be too flattering to governments. H. L. Mencken once made the remark that it is a sin to think evil of people, but very seldom a mistake. I think this particularly applies to government. Most people have not taken sufficiently into account the pros and cons as the Government may see them. I predict now that we have started, there will be plenty more indexed issues on the sort of basis which has been widely predicted for the forthcoming issue. Many of the reasons sound somewhat cynical, but I do not think that reduces their validity. Would the Treasury be happier with a form of borrowing with a low immediate financing cost or a high one? The answer is clear. Now that there is a market valuation to be put on index-linked contracts, is the Civil Service happier with a high valuation or a low one? The answer is obvious. If one is trying to widen the borrowing base, what is the point of doing it in only 1 billion pounds? Although I do not deplore the issue, I think that Mr Gunson is quite right to point out that this is going to make the process of 'crowding out' a good deal more efficient from the Government's point of view.

A point that is quite important is that expectations of inflation in Whitehall are bound to be lower than outside. It is only natural in any organization that the managers will take a rosier view than an outsider will do. So index-linked borrowing must look a more attractive proposition to the average government adviser than it does to us. It now appears that the disruptive effect on other markets is not likely to be nearly as great as we had feared.

Finally, I very much agree with the point made against having any restrictions. It is most ironical that you do not have to be a U.K. national to own 'Granny bonds', but you do have to be a U.K. pension fund to own this index-linked security.

Mr G. F. Chamberlin: I believe that the author's paper points us towards a better understanding of some of these economic laws which are at work. I consider that if one follows those indications through, one would be led to take the side of Mr Gunson and others in reflecting on the great dangers of the index-linked security.

It has been pointed out that possibly to have this form of security will introduce a discipline into the country. However, it is possible to look at that the other way round. The fact that we have such rampant inflation over the last decade is an indication to me that in our financial affairs we do not have discipline. It is a question perhaps, as in §2.6, of looking at things from the Government's point of view. If one asks what is inflation all about, I would say it is the fact that our expectations as a nation for some time have exceeded our performance. There is a price to pay for that, and the price is extracted largely through inflation. So there is a very definite reason for the inflation. It is very significant, in §2.6, that the inflation in the particular year just about wipes out the PSBR in real terms. In other words, our workforce through the unions have been able to push up wages, and property owners would, perhaps have been able to increase the rack rent. These forces are at work, and people have taken more than has been produced. If, therefore, we increase our hopes without increasing our performance, we shall undoubtedly get into a kind of positive feedback, which is indicated by the very simple equation \( x = kx \) in §2.10 in the paper. This is a very grave danger indeed, and it is exacerbated by the fact that the term of the Government is five years, but the term of the index-linked stock which we see before us is fifteen years. The present Government is not going to have to pay for the consequences of that stock should inflation go out of control in those fifteen years, and this would largely apply to any other stocks which may be introduced by future governments.

The question then is how to make the performance match the expectations. One can lower the
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expectations, but there is no need for a body of able men and women to do that. The performance can be improved.

The question has in effect been put by the author—how can we overcome inflation? We must find a means of improving performance and I believe that the means is at our disposal. This is not the place to go into it, but it is through the incidence of taxation, the main incidence of taxation being PAYE and national insurance contributions. It is employment-based, and it tends, as it increases, to reduce employment. The key really is given to us by the author in § 4.4. It is in a slightly different context, but he refers to what an employer can afford being dependent upon the 'value added' by the employees. I think that is the crucial aggregate when looking at any company. What is the 'value added' per employee? A company in a good location would be able to produce a high 'value added' per employee. Employment-based taxation will not hurt it too much. A company in an outlying area will have a low 'value added' per employee. The high employment-based taxation such as we have will tend to put that firm out of business. The effect of taxation is to bring in the margins at which production is possible. We need to change the whole basis of our taxation if we are eventually to solve these problems.

Mr A. Hinton (a visitor): I would like to look at the concept of index-linking on a broader scenario than purely with regard to pension schemes. Looking at the life assurance industry as a whole, I think we are seeing and have seen some of the largest changes for some decades. Worldwide, there has been a switch from saving by means of life assurance policies to short- or medium-term saving, such as building societies and bank deposit accounts. I believe there will be considerable changes with the introduction of monetary-based control, which will increase the volatility of a short and, therefore, new gilt market as has happened in America.

While index-linking may have considerable merit, it is still a premise which is untested and will not be fully tested until maturity of the first index-linked stock. It is, however, in this case subjecting the purchaser to a very low initial rate of return. Against this, because of the pressure of Government funding, the gilt market is now giving a very good real rate of return with a high initial yield on conventional gilt stocks. If this particular stock is held to redemption, there will be a very large part payment made on the final date. Meanwhile, there is a loss of reinvestment income which would have been available, and the stock is going to be considerably more volatile, at least during the earlier years of its life.

Against this, there is one situation where life assurance companies have the advantage over shorter-term savings media, and that is when there is a falling rate of inflation. If the conventional gilt stock is bought at the present price and inflation comes down well into single figures, the total return over the period will be better than money deposited at variable rates. I would therefore urge caution, because of the fact that this particular stock or any similar stock removes that very particular advantage, if there are markedly declining rates of inflation.

Mr A. D. Shedden F.F.A.: It was a former President of the Faculty, Mr Thornton, who in his Presidential Address had some harsh words to say about the erosion of inflation on pensioners and savers generally. I wholeheartedly agree with these sentiments, and I am, therefore, in favour of the Government issuing index-linked securities. I deem this to be a return to the issuing of gilt-edged stock, instead of the rather risky fixed-interest securities that have been on offer for the past few years.

Being a colleague of the author, I am used to thinking in terms of this curious other currency that one must translate to when considering the ramifications of index-linking. Therefore, I am less alarmed than some speakers about the problem of repayment of the debt, subject to the debtors being aware of the problem, i.e. that the debt increases in monetary terms and provision must be made accordingly.

I am also in favour of the index-linked concept being extended to the taxation of institutions and individuals. Like the author, I agree that the private investor has suffered greatly taxwise from high rates of inflation. This has caused him to be taxed at much higher rates than envisaged. It is relatively easy to see how capital gains tax could be mitigated by the indexing of capital gains. The arguments against such indexing have been over-stressed. The Irish, for example, do not seem to have any difficulty in coping with the problem. However, it is difficult to see how one can easily combat the
excessive taxation of interest. The author refers to the fact that interest, to the extent that it is an
allowance for capital erosion, is being taxed unfairly. The only solution I can suggest is not to tax
interest at all! This might not be as radical as it initially appears provided tax relief for interest
payments was simultaneously dispensed with.

On an actuarial point, the author, in § 3.5, points out that with index-linked securities it will be
much easier for an office to find assets to match its liabilities. It is quite true that at their low coupon
rates the securities will be much longer, in immunizing parlance, and it will therefore be easier to find
assets of appropriate length for the liabilities; but it does not necessarily follow that it will be possible
to immunize the liabilities. I suspect that it may not be possible to immunize single premium liabilities
with stocks at a low coupon rate. This is because the relative values of assets and liabilities go the
wrong way, so that although one might buy an asset to match a liability of the same length, one will
find that whether the rate of interest moves up or down, a loss is made, rather than a profit. I would be
very interested if someone could confirm this supposition.

Mr G. V. Bayley, C.B.E.: May I draw your attention to § 2.9 where the author says that the case for
issuing index-linked securities was well argued in the Wilson Committee Report. I can only say that
the Committee's contribution would have been a deal quicker to prepare and a good deal improved if
his admirable analysis had appeared before the Committee's deliberations on the subject. Like others
I find the arguments very persuasive, but the Committee stopped short of full-throated advocacy of
index-linking financial contracts, chiefly because the wider issues it raises went beyond its terms of
reference, and a number of those issues have been raised this evening. But that apart, there are some
interesting differences between the Committee's thinking and the author's.

The author and the Committee are on all fours in recognizing that inflation is a kind of money
mechanism that seeks to reconcile inconsistent demands. In addition, the reconciling process is very
unjust. One question at issue is whether inflation is aggravated by indexing debt, but I do not think
that anybody has attempted to analyse it in any detail. To be more precise; would an increment to the
rate of inflation be greater if all debt were indexed? The Committee's Report suggested that it would.
The author claims in § 2.10 that this particular examination question was not answered properly! So,
please can one member just have another resit because the question is rather important?

It seems to me that indexation of any sector of the economy must reduce relatively the money base
that remains; more specifically the extent to which money is used as a store of value. The argument
then runs that the ranks of those who remain resistant to inflation are diminished in number, and this
causes it to be more volatile in exactly the same way as taxation becomes more volatile if you diminish
the tax base. (I read some support for this thesis in § 2.10(n) of the paper.)

In a world of fixed-money instruments borrowers admittedly derive windfall gains at the expense of
lenders when inflation turns out to be greater than expected, but the average lender has to reduce his
real spending quite promptly. I suggest that the average borrower does not increase his spending, at
all events by the same amount, for various reasons, and partly because of the second-order effects of
the extra inflation we are talking about. House-loan borrowers, incidentally, are a good example to
keep in mind when considering this point. Those windfall effects are unjust, and I agree; but it is the
net effect on the economy that we are concerned with in this discussion, and to make his point the
author would need to show that the net impact is neutral. I believe there are powerful reasons for
thinking it is negative, and I believe that to be true whether the borrowers in question are individuals,
businesses or even the Government. So I conclude that the net reaction of borrowers and lenders on
fixed-money instruments is to apply the brakes to price increases, apart from whatever other spenders
might do, and moreover that their response is immediate. If, on the other hand, all debt instruments
are indexed, the net resistance of borrowers and lenders to inflationary change would not be exerted
so swiftly and, incidentally, that seems to me a reasonable definition of a potentially destabilizing
influence. I concede that the second-order effects are also likely to provoke resistance to price
increases at the end of the day, but the time lag of the response is surely longer, and I think the
argument boils down to that.

Section 2.10(1), referring to the effects which index-linked securities have on equities, is really part
of the much wider question of how index-linking copes with uncertainty. If a limited liability
company undertakes an unlimited liability debt, then one uncertainty is removed from the
transaction between the company and the lender. That uncertainty is passed down the line to the equity shareholders. Overall, uncertainty remains and just will not go away. This is the point where, I fear, I parted company from Mr Lewin (J.I.A. 108, 19), because indexation of debt, fails to eliminate the uncertainties created by the original pressures. All it does is to share them around. It does not surprise me that corporate treasurers are unenthusiastic about committing their companies to indexed debt, even if they could do so. I have argued elsewhere that the circumstances in which they could contemplate doing so point almost equally to issuing more equity capital. There are other issues still, but they all revolve round the central point: indexation of securities transfers inflationary uncertainties facing contracting parties elsewhere. Fair enough; but the buck is unlikely to be welcomed with enthusiasm or even passively, and the consequences can be very far reaching.

I am surprised that not much comment has been devoted to the choice of index this evening. The prices of labour and capital are, for the most part, at arm's length. Quite apart from that, any policy for prices and incomes is likely to be controversial, and when earnings are rising slower than prices, I think the areas of conflict will be defused a bit by linking the index for investment incomes to earnings rather than prices. That appears to be a powerful argument in favour of an earnings index in spite of its practical difficulties, instead of the one chosen for the recent issue.

Mr P. A. Kelly: There is one point which has neither been mentioned in the paper nor in the discussion, but it is central to the question of index-linking, particularly in so far as it relates to pension schemes. That is the practice of certifying the adequacy of resources to meet the monetary pension liabilities. As you are aware, this is becoming almost standard practice within pension fund accounts, and I believe this is not really consistent with the very progressive approach that is embodied in the paper. The author is moving to a situation where all benefits should be described in real terms and valued as such, and I agree with that approach.

Mr P. B. Bell: The use of the word 'real' begs many questions. Whatever index is chosen for gilt-edged must apply to everyone whatever their spending habits, from commuters to coal miners, to colonels, to crofters, young and old, rich and poor. More fundamentally, no one knows how the Retail Prices Index should accommodate long-term advances in technology and prosperity, changes in fashion, or changes in public opinion as to what is a reasonable standard of living. Today's loaf of bread, the family saloon car, adequately warmed houses, bear very little resemblance to their counterparts of 30 years ago. The index may tell us something about how living costs this year compare with last year, but, over 15 or 30 years, the Retail Prices Index as a measure becomes controversial, subjective and unreliable.

The index is calculated by civil servants who are highly skilled, industrious and of unquestioned integrity. But they are inevitably and rightly, from the Government Actuary to the postman, the servants of their political masters, who set their objectives and their terms of reference. It is one thing for a Government department to calculate an index designed to record the past for the benefit of economic historians. It becomes quite another matter when that index is made the determinant of vast cash flow between government and different segments of the population. We really have no experience at all of that game. The French went someway down the indexation path before pulling back in alarm, and already they are accusing one another of rigging, or planning to evade, the indices. In the U.K. we have seen how curiously a money supply statistic can behave as soon as it is made into an instrument of government policy. The possibilities are endless, and already familiar, e.g. price controls, subsidies, surcharges, swings from indirect taxes to direct ones and vice versa.

Both the author and Mr Bayley quote the Wilson Committee's description of inflation as a mechanism for temporarily reconciling inconsistent demands. Quelle délicatesse! Mr President, may I call a spade a bloody shovel? Inflation is the mechanism whereby weak governments allow organized groups in a strong bargaining position, whether workers, managers or members of learned professions, to renege on their contracts with those groups which have less clout, the thrifty, the old and the sick. It is human greed and weakness, producing social and political pressures that have destroyed our currency. Is it really likely that if indexation spreads and all those pressures are heaped upon an index, that where all else in the past has given way, a statistical abstraction will stand firm? Lay not up for thyself treasures in indices, where far worse than moth and rust may corrupt! To be
practical, it may well be that securities linked to an index, preferably to a whole range of indices, have a useful role as part of an actively managed, mixed investment portfolio for a pension fund. It could be that the Retail Prices Index, even when grossly overburdened, will still prove a less inadequate long-term store of value than the pound or the dollar, but the point is that really no-one can be sure. We may be sorely disappointed. So let us not, as a profession, deceive our clients or ourselves that the new beast, that will see the tender light of day this week, or its brothers and sisters yet unborn, enables us positively to guarantee anyone a specific real rate of return.

Mr J. G. Day (closing the discussion): As the author has pointed out, he has written a paper urging the Government to issue index-linked stocks, and before the paper was even discussed they have announced they will do so. He must feel rather like the Israelite who, when marching round Jericho sounding off his trumpet, sees the walls fall down before he has completed his seventh lap!

Those who read the paper subsequently should be aware of its context in contemporary events. A year ago the Wilson Committee reported, and in chapters 5 and 17 of their Report discussed inflation and index-linking in some detail. The author's paper and the Scott Report were published simultaneously about a month ago, and since then there has been an issue of index-linked Government stock. The Wilson Committee did not make a firm recommendation, as Mr Bayley said, but they added “We hope that our discussion on the issue will help to inform public debate”. The Scott Committee recommended index-linked stock for pension funds, and also hoped that there would be a wide discussion on certain matters. This paper aims to encourage discussion of the issues involved in a professional forum; it is not, as are some papers in this Hall, a dispassionate learned paper, for the author enters the ring as an open protagonist. On occasions his wording is emotional, and sometimes his arguments appear contradictory. The paper is in fact almost something between a polemic and a tract, but it is a very proper paper for the Institute to discuss at this time, and what a splendid discussion it has produced. It has largely concentrated on certain subjects we are thinking about today, but one can say that everyone is against inflation, rather like sin. My own personal criticism is that the author's approach is so very statistical. He has, for example, managed to discuss the subject and the various investment implications without mentioning dividend restraint, which some of us remember, or incomes policies which could come back again.

I will now touch on the various parts of the paper. Part I has a conclusion which is not contentious, and I had imagined that there might be some contentious arguments about the statistical approach, but that has not really been the case. A statistical test only proves the conclusion against the particular hypothesis tested. As various speakers have pointed out, inflation is a subject in the economic and political area, so it is unlikely to be susceptible to statistical treatment. In fact, the figures could equally well be tested against the growth of universal suffrage or the power of the unions. There is also the minor point about the comparability of data, and we have had a splendid speech from Mr Bell on what is 'real' and what is 'the cost of living'. Someone even pointed out that the author, in his time, has forecast future rates of inflation.

Many of the arguments in Part 2 are directly derived from or are very similar to those in the Wilson Committee report, and it is a section of the paper which has attracted a great deal of attention. There have been feelings about the encouragement to borrow, from speakers who had doubts about the PSBR reduction, and Mr Brew pointed out the temptations there would be for the Government and the possible motives they might have—and there was some feeling that index-linked bonds might crowd out private issues.

On the new stock and the price, I estimate that the voting tonight was roughly 6-2 in favour of index-linked stock, and the general feeling seemed to be that once one got over the initial shortage, rates should be at least 3%. Again, Mr Brew made some interesting comments on the dangers of regarding an index-linked stock as having safety without further thought. He pointed out the form of policy decision which would now become general, one hopes.

I thought the weakest part of the author's case was when he stated that he did not really understand what the Wilson Committee meant by indirect knock-on effects. I think he was probably just being provocative, and this was really the same point as he discussed in § 2.10(n).

Various speakers, including Mr Gunson and Mr Limb, pointed out that they were worried about
the aggravation effect of index-linked stock, and Mr Bayley accurately set out the arguments on what might occur. The opener, on the other hand, was fairly optimistic on this score.

The author's treatment of companies' securities was relatively brief, and again Mr Bayley dealt very well with this subject. House purchase is not as well treated, I feel, as in the Wilson Committee report, although one speaker, Mr Kelly, did point out that there are now index-linked deposits and loans which are available to the public. The Wilson Committee did lay some emphasis on the advantages of having index-linking for house purchase, but it does seem to me that there are problems here in that the borrower has an income which, one assumes, is linked to earnings, and house prices do not necessarily move with the Retail Prices Index. As this is a very human area, index-linking against a Retail Prices Index could cause some problems.

The conclusions to the second part are really divided into two. The indexing of Government bonds is very firmly argued, but the conclusions on taxation and house-purchase mortgages almost appear like also rans, and Mr Shedden did argue that he wanted an extension of index-linking to other securities.

It was slightly disappointing that there were very few comments on part 3 which covered the effect of index-linking on life assurance business, because one felt that here the author was on home ground, and was making deliberately provocative remarks in the hope that this would produce reactions from members. Mr Shedden doubted whether immunization was possible with the new stock. It seems to me that if one does get index-linked stocks, and clearly having tried with one the Government is likely to produce others, they will provide actuaries with very considerable opportunities of ingenuity and expertise in the framing of contracts, and in the determination of with-profits policy. If, as the author suggests, that index-linked contracts are non-profit, then with-profit policies will be very different from what they were heretofore.

Part 4 was another area which produced a lot of strong feeling on pensions and index-linking. The opener, argued very forcefully that final salary schemes were only part index-linked, and were not therefore fair. Mr Smith made a very strong and powerful plea for index-linking throughout, and had some interesting figures on cost, maintaining that the unions and employees were prepared to pay for such pensions, and he gave some interesting figures on the proportion who were normally covered. In a sense, his arguments are very similar to those of the Scott Committee which, if I may say so in this Hall, was very much maligned, unfairly I think, in the Press, because it does seem to be a very good report indeed, and it has not been fairly treated. Its section on the real yields on equities barely got a mention, which was rather surprising.

The author is an intellectual protagonist who has argued the case for index-linked pensions very powerfully. The paper stimulates us and has provoked a wide ranging and important discussion. He has written from the point of view of a statistician, and from the point of view of an actuary in a traditional life office. One might also say a Scottish Life Office which was once described as the 'Actuary's Nirvana'!

No-one challenged the author's claim that he is anxious to get away from tax mitigation, and for offices to provide a real service to the community. In the past, actuaries have served the public, the country and the profession, and clearly they are anxious to continue doing so. It seems to me to be a very valuable paper, and the discussion it has provoked must be well worth his while.

The President (Mr A. R. N. Ratcliff): In proposing a vote of thanks to the author for a paper which has come at an extremely opportune time, I also would like to thank all those who have taken part in the discussion which has widened our understanding of the new situation which we are going to be living with very soon.

If I may make a private remark, I do not think, speaking as a non-life insurer, that the principle of inflation-linked liabilities is solely related to pension funds. There are many other areas of insurance operations where benefits, if not specifically linked to an index, nevertheless are very highly correlated with the movements in the wage index and the Retail Prices Index. I am thinking particularly of employers' liability benefits which are almost entirely correlated with the rate of change in earnings. Therefore I would hope that if we live in an economy which is becoming index-linked, then there is recognition of the fact that financial institutions, which are expected to provide wage-related benefits
or real benefits, ought to have the opportunity to participate in this form of investment if they wish, equally with pension funds.

Mr A. D. Wilkie (replying): As Mr Day said, the consensus was slightly more in favour of index-linked securities than against.

I appreciate Mr Bell’s fears about the Retail Prices Index. It is a pretty well constructed index; it is controlled to some extent by an independent committee; it uses a very large number of items; and it is re-weighted every year. I think it is the best we have in terms of independence. It would provide fairly rough justice, and I do not think it matters very much which index one uses for things such as government securities, because the interest rate can take account of the different expected rates of increase of Retail Prices Index and earnings index.

Mr Gunson and Mr Limb were on the whole the strongest critics of index-linked securities. Clearly one of the fears that people have—and this has been expressed to me outside this Hall—is that if ‘real’ living standards, however we define ‘real’, in the country substantially fall, then it is unreasonable to protect anybody against the consequences of that fall. I do not know what circumstances there might be, but in the aftermath of wars or in times of disastrous climatic changes or perhaps the Arabs deciding to cut off our oil supplies entirely, then the government of the day has to take appropriate steps to share out the misery all round, and index-linked stocks will provide no protection in that case. But that is not the position we have been in for the last, perhaps, 200 years. At no time in Britain over this period have earnings substantially fallen behind prices for any length of time at all. Even after the oil troubles, when oil prices were increased twice in the 1970s, the total real GNP per head is now some 20% higher than it was 10 years ago. So it is not a matter of sharing the misery out all round, but some greedy people having got rather more than is reasonable, to a great extent, at the expense of pensioners.

As far as Government stock is concerned, it is just a matter of making sensible contracts. Both sides are able to negotiate at arm’s length, and both sides should be able to negotiate one type of contract rather than another. There is no preference or protection being given by the government issuing index-linked stock. I do not know what the right rate of interest on such a stock should be. I have said what I think it might be in comparison with ordinary shares, and although the little bit on ordinary shares did not get much discussion, I have substantially more figures about the rate of increase of the real earnings on ordinary shares. One of the difficulties is that the ordinary market values fluctuate so much that the real return on ordinary shares depends on which particular time period you look at. Over about 50 years, it has been very much better than inflation, a fact that most people have not noticed. But even my figures show that!

WRITTEN CONTRIBUTIONS

The author subsequently wrote: My figures in Table 4.7 show that from June to June the real rates of return on ordinary shares up to 1980 were:

<table>
<thead>
<tr>
<th>Period</th>
<th>Rate of Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 years from 1959</td>
<td>3.1%</td>
</tr>
<tr>
<td>20 years from 1960</td>
<td>2.0%</td>
</tr>
<tr>
<td>19 years from 1961</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

The dividend yields in 1959, 1960 and 1961 were respectively 4.51%, 4.35%, 4.60%; in 1980 6.69%. If shares had stood in 1980 at around 4.5% the real returns would have been even larger. Mr Gunson suggests that ‘ordinary shares would have to give a better performance than they have over the last twenty years if they were to be regarded as a satisfactory alternative to indexation’. I don’t think the figures support him.

Mr Limb exaggerates the cost of repayment of indexed debt, perhaps by thinking in money terms. But the ‘real’ cost of repayment of £1,000 m indexed in 1996 will be just the same as £1,000 m now. In practice most government stocks are refinanced, not repaid, so each redemption date gives an opportunity to renegotiate the interest rate. The real cost of indexed stocks, if replaced perpetually by
new indexed stocks, is thus a perpetuity of the real amount of interest, with the rate changing from time to time.

Mr Limb also raises the serious problem that the working population will be reluctant to transfer sufficient resources to the retired population. Indeed, they may, and possibly the inflation of recent years has been the working population’s response to government efforts to make larger transfers to pensioners. My calculations in § 4.3 attempt to show crudely the cost of such transfers. And, pace Mr Smith, I was not implying here that schemes do give a pension of two-thirds of final salary, but only showing the cost if they were to.

Mr Shedden is of course correct about the immunization problem when there is only one dated stock. Actuaries could work with two stocks, one very short and one much longer or irredeemable. I hope the next issues of index-linked stock satisfy this requirement.

I agree with Mr Bayley about company securities, as I imply in § 2.13. Companies can, if they choose, always offer shares. My target was the Government, which in the past has issued only fixed money stocks. ‘Public Equity’ would be an even more radical departure than index-linked stocks.

I was sorry that no one discussed the problems, or the possibility, of extending index-linking to ordinary life assurance, though some speakers did argue in favour of wider eligibility for the indexed stocks. Perhaps this will come too. But we also need changes in the rules for qualifying policies.

Mr H. A. R. Barnett: The author has investigated the course of inflation over a long period of years, and although he has not been able to devise a single time-series model which describes the movement of prices over the whole period he has found a possible relationship between the rate of interest and the rate of inflation which is not very different from one which I suggested in the past. However, the prime purpose of his paper is to present the case for the issue of long-term index-linked stocks, index-linked annuity and assurance contracts, and index-linked pension scheme benefits; this would result in a Utopian model (my words, not his) which in theory would inoculate against the effects of inflation those members of the community most likely to be adversely affected by it. Once I was of a similar opinion, at least as far as advocating the index-linking of pensions; but as I have grown older I have learned to distrust models and to regard those which look attractive as seldom working in practice.

Let us consider the extreme situation, where the moment an inflationary increase in pay is given to a body of key workers, a like increase in the price of the goods they produce takes place, and so do increases in all other goods, services and so on; under the author’s proposals the long-term savers would receive the benefit of their inoculation and, leaving aside for the moment influences from other countries, all would be back where they started. The pound sterling would depreciate, we should need more pounds for our exports but would have to give more for our imports (including raw materials) and again, we would be back where we started provided our overseas trade is exactly in balance.

However, the model breaks down in practice, since the adjustments following the first inflationary increase would not be immediate. Depending on the length of the time-lag, the workers gaining the first increase would obtain a temporary benefit over their fellow countrymen, and the more who are inoculated and the shorter the period of temporary advantage, the greater would be the percentage demanded in the first place in order to make the most of the advantage. So we have a recipe for the hyperinflation which the author fears.

There is nothing new in index-linked bonds. We used to have them in this country. They were known as gold sovereigns and retained their real value as long as they were not exchanged for anything else. There was another type of index-linked bond known as a bank-note, on which the wording ‘I promise to pay . . .’ meant something although there was a relatively small fiduciary issue. But when most of the world’s gold flowed towards just one country, the gold standard was abandoned, and there was inflation and part default on the second type of index-linked (or gold-linked) bonds. They were no longer ‘as good as gold’ while the other type, which were ‘worth their weight in gold’ were called in. I believe the author’s suggestion would be in danger of a similar breakdown and default because the economy would not be able to stand the ultimate strain, and I fear that the Wilkie Bond, while it may be a useful palliative if taken in moderation, cannot be regarded as a panacea for all inflationary ills and, like all drugs, might bring with it unforeseen side effects.
Nevertheless I feel that the author has done the profession a sterling service, possibly an index-linked service, in compiling his paper as a vehicle for discussing this important subject.

Professor R. E. Beard: About six months ago I sent a copy of some notes I had prepared summarizing some experiments into the pattern of inflation to GIRO. They are relevant to the first section of Mr Wilkie’s paper and provide food for reflection on the general proposition of index-linking.

Briefly the rationale of time-series analysis is to separate the terms into a functional relationship and a random residual. The marked exponential growth in the Retail Prices Index over the past 50 years raises doubts as to the suitability of this index as a basis for study and one alternative is to consider the behaviour of the reciprocal of the Retail Prices Index which is an index of the value of money. On tabulating this quantity over the last 30 years I was surprised to note that apart from a major cyclical type of fluctuation in the last 10 years the series showed a linear decrease.

Further analysis showed that a linear decrease in the value of money can be generated if the proportionate increase in the rate of inflation is proportional to the rate in the previous year. It appeared that the proportionality constant increased rather abruptly about 1970.

The inference from this analysis is that the rate of inflation is strongly dependent on the anticipation of the level in the immediate future. Prior to about 1950 the rate of inflation was small compared with other factors and the ‘gearing’ was not significant. From this time there was almost certainly some anticipation, partly influenced by the belief that unemployment could be minimized by building a modest inflation into the system. As this tended to generate higher inflation rates so it became necessary for financial reasons for companies to make specific allowances and for wage demands to follow suit.

If this model does give the true behavioural genesis of the inflation process then it means that a long-term projection based on purely statistical methods is of little value as it is inevitable that the rate of inflation will ‘explode’. An alternative feature is that the value of money decreases to zero (as also follows from the decreasing linear trend) so that some assumptions must be introduced if a rational projection is to be justified.

The awkward feature is that the ‘explosion’ is only about five years ahead if inflation reaches a figure of about 20% so that projections beyond this period can only be justified if the singularity is avoided by a reduction in the inflation rate, and by elimination or reduction of the compound effect of the anticipation, or by considering the consequences of a currency collapse.

Index-linking may be a long-term solution for isolated sectors of the economy but if it is suitable for some sectors it would seem reasonable to assume that it will become universal. If everything is index-linked what is then to be used as an index to prevent further ‘explosions’?