INDEXING LONG-TERM FINANCIAL CONTRACTS

by


[Submitted to the Faculty 15th February 1982. A Synopsis of the paper will be found on page 106]

FOREWORD

This paper is identical with that discussed at the Institute of Actuaries in London on 23rd March 1981, with the addition of this foreword, which would be better read as an afterword, since it records what has happened in the time since the original paper was written.

First, to update some figures: In the year ending June 1981 the Retail Prices Index rose by 11.3%. This is within the 95% forecast interval for all the models quoted in sections 1.8 and 1.9 except the (2, 0, 0) model, which forecast a rate of 20.5%, and a 95% interval of 11.6% to 40.5%. The decline from the 1979-80 rate is in line with any of the (p, 1, q) models, which generally predict inflation falling to a constant mean level. The (p, 2, q) models, however, predict inflation staying essentially at its latest level indefinitely, and their forecasts are now all reduced.

The F.T.-Actuaries 500 share index rose by 19.0% over the year from 30th June 1980 to 30th June 1981, and had a dividend yield of 5.74% at the end of the year. This allows a further line of Table 4.7 to be added:

<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>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>75.2</td>
<td>70.9</td>
<td>878.1</td>
<td>5.74</td>
</tr>
</tbody>
</table>

The real return on investment in this index was thus 11.3% as well, and the real yield over the six years since mid 1975 has been 8.7%.

The most important event of the year has been the issue by the Government of two index linked Treasury stocks. These are available only for pension funds and for the pensions business of life offices. This simplifies the tax problem, but restricts the range of potential holders. Both stocks carry a 2% coupon, and are indexed fully for interest and capital payments, using in each case the Retail Prices Index for the month eight months before the issue date or date of
Indexing Long-term payment. This eight-month lag creates small problems in calculating the real redemption yield, and the market has not yet agreed on a convention that will produce a common method of calculation, though the differences are not large.

Both stocks were issued by tender, with no minimum price published. The first was presaged by the Chancellor in his budget speech of 10th March, in which he proposed “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”. The same day the Bank of England announced the issue of £1,000 million of 2% Treasury Index Linked 1996, with an unusual delay of two weeks before its issue on 26th March. There was considerable speculation at the time about the appropriate level at which to tender, and the level at which it might be sold. Some very optimistic commentators spoke of a negative or zero real yield, and some bids were even put in at this level. In the event the minimum price accepted was 100, to give a real yield of around 2%. (The purchase price was payable in instalments of 35 on 27th March, 30 on 1st May, and 35 on 26th May).

A second stock was issued in July also of £1,000 million of 2% Treasury Index Linked 2006. This was again issued by tender, but did not quite sell out at a price of 86, giving a real yield of nearly 3%. The remainder, however, was sold on the market immediately at 86. (Again the purchase price was payable in instalments of 30 on 8th July, 30 on 14th August, and 26 on 11th September).

Naturally the price of the 1996 stock fell to give a real yield of about 3%, too, and both stocks traded at about these yields till the end of the year. It is notable that their yields did not rise to any great extent when the yields on conventional fixed interest stocks rose from a roughly 14% yield to a 16.5% yield during the latter half of 1981.

No further index linked stocks were issued during 1981, and there has been no move to extend the possible holders of the existing stocks beyond the present restricted set of pensions institutions. However, the interest on the stocks is paid net of tax, which indicates that the possibility of future extension must have been considered at the time of issue. A number of conventional fixed interest Government Stocks have, however, been issued over this period. The Government is not yet whole-hearted about these issues.

The qualifying age and maximum holdings of Index Linked National Savings Certificates (formerly “Granny Bonds”) have however been respectively reduced to zero and increased to £5,000 making them available to all. These certificates have proved popular, and
by October 1981 the amount outstanding included £3,223 million of principal and £719 million of index linked addition.

The accounting for these certificates throws up an anomaly in the presentation of government accounts, which will probably also occur with the index linked stocks. The indexed increase in principal is treated as "Debt Interest", added to Government Current Expenditure, and hence increases the Public Sector Borrowing Requirement, an item whose control is a major feature of Government policy. Yet of course this part of the PSBR is automatically financed by the indexed increase in principal anyway, and is thus of no great significance. If all government debt had been index linked and there had been no net increase in debt, the nominal PSBR would simply have represented the indexed increase in the nominal amount of the stocks. It is really essentially that, as I discuss in section 2.6, public sector accounting is put onto a proper inflation adjusted basis. This would demonstrate that the Government has been running a substantial surplus, not a deficit, during the worst recession since the war!

The only other relevant event has been the publication of the Occupational Pensions Board Report on Improved Protection for the Occupational Pensions Rights and Expectations of Early Leavers, discussed at the Faculty in November 1981. The main recommendation from a clearly divided group was that pension funds, although they might aim to index deferred pensions according to an earnings index, should only be obliged to index them by the lower of 5% and the increase in earnings over the period from leaving to retirement. Obviously this is pitifully small at a time of double digit inflation and goes only a trivial way to rectifying the injustice I refer to in section 4.8. But this topic has been well enough aired at the Faculty already.

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
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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:

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

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 and Faculty Libraries. 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
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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 that economic circumstances may have changed in that

**Fig. 1**
Price index from 1661 to 1740.

**Fig. 2**
Price index from 1740 to 1820.
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 irregu-
larly 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</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974-75</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
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(1, 0, 0) model, i.e. \( x_t' = x_{t-1}' + \varepsilon_t \) with \( x_1 \) near 1, or of a (0, 1, 0) model, i.e. \( x_t - x_{t-1} = \mu + \varepsilon_t \), where \( x_1 \) 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:

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

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 \( \hat{\sigma} \) of 0.0658, 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 prospects 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 (\( \mu \) for most of the \( (p, 1, 0) \) models was \(-0.0016\)) or the mean might well have been zero (the standard error of \( \mu \) 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% (\( \mu = 0.0639 \) for the (3, 1, 0) model) but would probably be within 13% of their present levels (\( \exp (1.96 \times 0.0639) = 1.133 \); \( \exp (-1.96 \times 0.0639) = 0.882 \)). 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, 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 (–0·5%) and 1946-47 (–0·2%). 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 97½% limit, expected value and lower 2½% 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
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:

<table>
<thead>
<tr>
<th>Model:</th>
<th>Residual standard deviation $\hat{\sigma}$</th>
<th>40-year forecast</th>
<th>Expected</th>
<th>Lower 2½% limit</th>
<th>Based on 1896–1980 data</th>
<th>Based on 1661–1980 data</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2, 0, 0)</td>
<td>0.0542</td>
<td>37.2%</td>
<td>27.3%</td>
<td>18.1%</td>
<td>16.9%</td>
<td>11.1%</td>
</tr>
<tr>
<td>(1, 1, 0)</td>
<td>0.0554</td>
<td>9.3%</td>
<td>4.7%</td>
<td>0.4%</td>
<td>4.9%</td>
<td>4.9%</td>
</tr>
<tr>
<td>(2, 2, 0)</td>
<td>0.0576</td>
<td>58.0%</td>
<td>20.7%</td>
<td>-7.9%</td>
<td>773-fold</td>
<td>11.0%</td>
</tr>
<tr>
<td>(0, 2, 2)</td>
<td>0.0560</td>
<td>30.9%</td>
<td>17.3%</td>
<td>5.2%</td>
<td>773-fold</td>
<td>4.9%</td>
</tr>
<tr>
<td>(1, 2, 1)</td>
<td>0.0549</td>
<td>15.8%</td>
<td>10.9%</td>
<td>6.1%</td>
<td>11.5%</td>
<td>4.9%</td>
</tr>
<tr>
<td>(6, 0, 0)</td>
<td>0.0660</td>
<td>22.0%</td>
<td>16.1%</td>
<td>10.5%</td>
<td>11.5%</td>
<td>4.9%</td>
</tr>
<tr>
<td>(5, 1, 0)</td>
<td>0.0666</td>
<td>5.1%</td>
<td>1.5%</td>
<td>-1.9%</td>
<td>11.5%</td>
<td>4.9%</td>
</tr>
</tbody>
</table>

The range of results is almost overwhelming. The upper 97½% 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 2½% 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.

1.9. Period D, 1946-80

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 3</td>
<td>0.0391</td>
<td>0.0443</td>
<td>0.0414</td>
<td>0.0420</td>
<td>0.0416</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>38.6</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 $6.1 \times 10^{28}$-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
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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>Year</th>
<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>16.1</td>
<td>1991</td>
<td>267.8</td>
</tr>
<tr>
<td>1982</td>
<td>131.1</td>
<td>12.9</td>
<td>1992</td>
<td>256.9</td>
</tr>
<tr>
<td>1983</td>
<td>145.4</td>
<td>10.9</td>
<td>1993</td>
<td>307.3</td>
</tr>
<tr>
<td>1984</td>
<td>159.3</td>
<td>9.6</td>
<td>1994</td>
<td>329.1</td>
</tr>
<tr>
<td>1985</td>
<td>173.1</td>
<td>8.7</td>
<td>1995</td>
<td>352.4</td>
</tr>
<tr>
<td>1986</td>
<td>187.3</td>
<td>8.1</td>
<td>1996</td>
<td>377.3</td>
</tr>
<tr>
<td>1987</td>
<td>201.8</td>
<td>7.8</td>
<td>1997</td>
<td>403.9</td>
</tr>
<tr>
<td>1988</td>
<td>217.0</td>
<td>7.5</td>
<td>1998</td>
<td>432.4</td>
</tr>
<tr>
<td>1989</td>
<td>233.0</td>
<td>7.4</td>
<td>1999</td>
<td>462.9</td>
</tr>
<tr>
<td>1990</td>
<td>249.9</td>
<td>7.3</td>
<td>2000</td>
<td>495.5</td>
</tr>
</tbody>
</table>
Indexing Long-term

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 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:

<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>296</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>0.9</td>
</tr>
</tbody>
</table>

2,000 100.0

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 set of such stock was issued, and insurance companies and pension funds bought net some £4,800 m of government stock
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(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>
<tr>
<td><strong>2,000</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>

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 un-
certainty 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
£3,600 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 nega-
tive 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 employ-
ment’ 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 find 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 ‘persua-
sion’ 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\(\frac{1}{2}\)% 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, $i_t$:

$$y_t = 0.025 + 0.04 + 0.6i_t - 0.0(4) = 0.041 + 0.6i_t$$

i.e. the rate of interest is $2\frac{1}{2}\%$ 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 $2\frac{1}{2}\%$ 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:

<table>
<thead>
<tr>
<th>Year</th>
<th>Inflation (%)</th>
<th>Interest rate (%)</th>
<th>Inflation (%)</th>
<th>Interest rate (%)</th>
<th>Inflation (%)</th>
<th>Interest rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>9.6</td>
<td>9.8</td>
<td>8.3</td>
<td>9.1</td>
<td>17.9</td>
<td>14.8</td>
</tr>
<tr>
<td>1982</td>
<td>13.4</td>
<td>12.1</td>
<td>6.1</td>
<td>7.8</td>
<td>9.9</td>
<td>10.0</td>
</tr>
<tr>
<td>1983</td>
<td>9.0</td>
<td>9.5</td>
<td>12.9</td>
<td>11.8</td>
<td>1.8</td>
<td>5.2</td>
</tr>
<tr>
<td>1984</td>
<td>17.6</td>
<td>14.7</td>
<td>15.5</td>
<td>13.4</td>
<td>-1.4</td>
<td>3.3</td>
</tr>
<tr>
<td>1985</td>
<td>16.8</td>
<td>14.2</td>
<td>14.7</td>
<td>12.9</td>
<td>-3.4</td>
<td>2.0</td>
</tr>
</tbody>
</table>

1986 20.4 16.3 20.2 16.2 4.6 6.9
1987 24.7 18.9 18.6 15.2 4.0 6.5
1988 21.4 17.0 9.3 9.7 6.7 8.1
1989 20.3 16.3 8.5 9.2 2.8 5.8
1990 16.9 14.2 12.9 11.9 5.1 7.2
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>Relative real &quot;real interest&quot;</th>
<th>Relative net new borrowing</th>
<th>Relative real total interest</th>
<th>Relative real &quot;real interest&quot;</th>
<th>Relative net new borrowing</th>
<th>Relative real total interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>1986</td>
<td>76.8</td>
<td>87.4</td>
<td>84.8</td>
<td>81.5</td>
<td>87.5</td>
<td>86.0</td>
</tr>
<tr>
<td>1991</td>
<td>51.7</td>
<td>73.4</td>
<td>68.2</td>
<td>72.5</td>
<td>82.9</td>
<td>86.4</td>
</tr>
<tr>
<td>1996</td>
<td>72.8</td>
<td>75.3</td>
<td>74.7</td>
<td>85.3</td>
<td>80.1</td>
<td>81.3</td>
</tr>
<tr>
<td>2001</td>
<td>66.7</td>
<td>65.0</td>
<td>65.4</td>
<td>130.0</td>
<td>82.7</td>
<td>94.1</td>
</tr>
</tbody>
</table>

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
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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 $2\frac{1}{2}$ 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 $2\frac{1}{2}\%$, 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>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>87.3</td>
<td>38.5</td>
<td>115.6</td>
</tr>
<tr>
<td>1991</td>
<td>76.8</td>
<td>23.8</td>
<td>124.8</td>
</tr>
<tr>
<td>1996</td>
<td>79.4</td>
<td>24.9</td>
<td>129.8</td>
</tr>
<tr>
<td>2001</td>
<td>79.7</td>
<td>20.9</td>
<td>129.6</td>
</tr>
</tbody>
</table>

The net new borrowing, under these assumptions is only required to finance interest in excess of $2\frac{1}{2}\%$ 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 $2\frac{1}{2}\%$ 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 index-linked funding will give a more stable course in real terms.

All these calculations relate only to the funding of interest pay-
ments 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>Relative real new borrowing</th>
<th>Relative net total interest</th>
<th>Relative real new borrowing</th>
<th>Relative real total interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>100-0</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>104·6</td>
<td>84·0</td>
</tr>
<tr>
<td>1991</td>
<td>64·0</td>
<td>130·2</td>
<td>114·3</td>
<td>84·2</td>
</tr>
<tr>
<td>1996</td>
<td>106·4</td>
<td>135·5</td>
<td>128·6</td>
<td>109·2</td>
</tr>
<tr>
<td>2001</td>
<td>104·8</td>
<td>128·5</td>
<td>122·8</td>
<td>114·4</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—as 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 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 find 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.
(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 con-
sideration 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.

(a) 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 the 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 misunderstanding 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
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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 wages 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 objective 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.

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, practically, 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 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}%.

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
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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 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.
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.

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 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>
<thead>
<tr>
<th>Inflation</th>
<th>Years</th>
<th>15</th>
<th>25</th>
<th>35</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td></td>
<td>481</td>
<td>295</td>
<td>181</td>
</tr>
<tr>
<td>15%</td>
<td></td>
<td>123</td>
<td>30</td>
<td>8</td>
</tr>
<tr>
<td>25%</td>
<td></td>
<td>35</td>
<td>4</td>
<td>0·4</td>
</tr>
</tbody>
</table>

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...
Indexing Long-term

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' expenditures 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 0.5 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
Financial Contracts

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 I.
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 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.

<table>
<thead>
<tr>
<th>Year</th>
<th>&quot;Real&quot; share price index</th>
<th>&quot;Real&quot; implied dividend index</th>
<th>&quot;Real&quot; rolled-up index</th>
<th>Dividend yield (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>6.09</td>
</tr>
<tr>
<td>1931</td>
<td>79.9</td>
<td>79.0</td>
<td>84.7</td>
<td>6.01</td>
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<td>1932</td>
<td>65.7</td>
<td>58.0</td>
<td>73.4</td>
<td>5.37</td>
</tr>
<tr>
<td>1933</td>
<td>94.9</td>
<td>54.5</td>
<td>109.7</td>
<td>3.49</td>
</tr>
<tr>
<td>1934</td>
<td>106.1</td>
<td>58.5</td>
<td>126.7</td>
<td>3.36</td>
</tr>
<tr>
<td>1935</td>
<td>114.5</td>
<td>64.8</td>
<td>141.5</td>
<td>3.45</td>
</tr>
<tr>
<td>1936</td>
<td>119.4</td>
<td>66.9</td>
<td>152.6</td>
<td>3.41</td>
</tr>
<tr>
<td>1937</td>
<td>113.3</td>
<td>74.1</td>
<td>150.6</td>
<td>3.08</td>
</tr>
<tr>
<td>1938</td>
<td>89.9</td>
<td>78.0</td>
<td>125.8</td>
<td>5.28</td>
</tr>
<tr>
<td>1939</td>
<td>82.6</td>
<td>69.3</td>
<td>121.5</td>
<td>5.11</td>
</tr>
<tr>
<td>1940</td>
<td>44.7</td>
<td>60.0</td>
<td>71.0</td>
<td>8.17</td>
</tr>
<tr>
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<td>53.7</td>
<td>48.3</td>
<td>90.1</td>
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<td>63.8</td>
<td>48.6</td>
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<td>1943</td>
<td>79.9</td>
<td>52.6</td>
<td>140.0</td>
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<tr>
<td>1944</td>
<td>88.8</td>
<td>55.3</td>
<td>168.3</td>
<td>3.79</td>
</tr>
<tr>
<td>1945</td>
<td>88.4</td>
<td>56.3</td>
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<td>3.54</td>
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<td>1946</td>
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<td>1948</td>
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<td>188.9</td>
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<tr>
<td>1949</td>
<td>72.6</td>
<td>63.6</td>
<td>169.9</td>
<td>5.33</td>
</tr>
<tr>
<td>1950</td>
<td>76.6</td>
<td>62.2</td>
<td>188.3</td>
<td>4.94</td>
</tr>
<tr>
<td>1951</td>
<td>82.2</td>
<td>63.2</td>
<td>211.4</td>
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<tr>
<td>1952</td>
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<td>61.2</td>
<td>154.7</td>
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</tr>
<tr>
<td>1953</td>
<td>63.9</td>
<td>61.6</td>
<td>185.5</td>
<td>5.87</td>
</tr>
<tr>
<td>1954</td>
<td>85.1</td>
<td>70.5</td>
<td>250.5</td>
<td>5.04</td>
</tr>
<tr>
<td>1955</td>
<td>100.8</td>
<td>76.6</td>
<td>321.7</td>
<td>4.63</td>
</tr>
<tr>
<td>1956</td>
<td>83.5</td>
<td>77.7</td>
<td>281.4</td>
<td>5.67</td>
</tr>
<tr>
<td>1957</td>
<td>91.6</td>
<td>80.0</td>
<td>325.3</td>
<td>5.31</td>
</tr>
<tr>
<td>1958</td>
<td>80.6</td>
<td>75.5</td>
<td>302.5</td>
<td>5.70</td>
</tr>
<tr>
<td>1959</td>
<td>106.8</td>
<td>79.1</td>
<td>418.7</td>
<td>4.51</td>
</tr>
<tr>
<td>1960</td>
<td>129.2</td>
<td>92.4</td>
<td>528.5</td>
<td>4.35</td>
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<tr>
<td>1961</td>
<td>134.6</td>
<td>101.7</td>
<td>576.0</td>
<td>4.60</td>
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<tr>
<td>1962</td>
<td>105.8</td>
<td>95.4</td>
<td>477.7</td>
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<td>1963</td>
<td>127.2</td>
<td>94.3</td>
<td>600.1</td>
<td>4.51</td>
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<tr>
<td>1964</td>
<td>136.3</td>
<td>103.3</td>
<td>673.0</td>
<td>4.61</td>
</tr>
<tr>
<td>1965</td>
<td>114.0</td>
<td>110.7</td>
<td>595.8</td>
<td>5.91</td>
</tr>
</tbody>
</table>
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 1966; 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 −0.8% p.a. (1957-77); but from 1930 to 1950 the change was −2.3% p.a. Such results are consistent with the lower 21/2% forecast for 10 or 20 years ahead, using

### Table 4.7. (Cont.)

<table>
<thead>
<tr>
<th>Year</th>
<th>&quot;Real&quot; share price index</th>
<th>&quot;Real&quot; implied dividend index</th>
<th>&quot;Real&quot; rolled-up index</th>
<th>Dividend yield (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966</td>
<td>130.7</td>
<td>109.1</td>
<td>717.7</td>
<td>5.08</td>
</tr>
<tr>
<td>1967</td>
<td>121.9</td>
<td>102.7</td>
<td>703.7</td>
<td>5.13</td>
</tr>
<tr>
<td>1968</td>
<td>169.5</td>
<td>98.9</td>
<td>1013.4</td>
<td>3.55</td>
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<tr>
<td>1969</td>
<td>148.6</td>
<td>89.6</td>
<td>924.6</td>
<td>4.08</td>
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<td>1970</td>
<td>121.5</td>
<td>96.6</td>
<td>792.9</td>
<td>4.84</td>
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<tr>
<td>1971</td>
<td>142.8</td>
<td>89.8</td>
<td>967.1</td>
<td>3.83</td>
</tr>
<tr>
<td>1972</td>
<td>161.1</td>
<td>91.6</td>
<td>1129.1</td>
<td>3.46</td>
</tr>
<tr>
<td>1973</td>
<td>138.1</td>
<td>88.0</td>
<td>1005.4</td>
<td>3.88</td>
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<tr>
<td>1974</td>
<td>66.1</td>
<td>82.2</td>
<td>518.0</td>
<td>7.56</td>
</tr>
<tr>
<td>1975</td>
<td>63.8</td>
<td>70.8</td>
<td>533.1</td>
<td>6.76</td>
</tr>
<tr>
<td>1976</td>
<td>71.2</td>
<td>69.6</td>
<td>630.5</td>
<td>5.95</td>
</tr>
<tr>
<td>1977</td>
<td>76.2</td>
<td>68.3</td>
<td>712.2</td>
<td>5.45</td>
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<tr>
<td>1978</td>
<td>77.5</td>
<td>70.8</td>
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<td>5.56</td>
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<tr>
<td>1979</td>
<td>82.6</td>
<td>70.9</td>
<td>857.0</td>
<td>5.22</td>
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<tr>
<td>1980</td>
<td>71.3</td>
<td>78.3</td>
<td>788.9</td>
<td>6.69</td>
</tr>
</tbody>
</table>
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% positive real gross return; and if the real growth rate of dividends were even as good as zero the return of 6½% 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 0.1% 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 (–0.1% and –0.6%, 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 time-lag 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.
ACKNOWLEDGEMENTS

I should like to thank all those whom I have unwittingly plagiarised; my wife, Patricia, and my colleagues who have all put up with interminable discussion on this subject; and Eleanor Runciman for some marvellously rapid and accurate typing.

REFERENCES

The prime purpose of the paper is to present the case for the issue of long-term index-linked stocks by the government and by other borrowers, for the issue of index-linked life assurance and annuity contracts by life offices and for the index-linking of pension scheme benefits, all of which the author believes are possible and would be beneficial to all parties.

Part 1 of the paper uses the methods of statistical time-series analysis to study the way in which inflation has behaved in the U.K. over the long period 1661 to 1980 and over various shorter and more recent periods. While prices were far from static in the period up to 1914 the average change was nevertheless almost nil. However, during the 20th century prices have generally risen and in recent years this rise has accelerated. It is possible that the series has become unstable, and hyperinflation will result. It is certain that no one statistical model can satisfactorily “explain” the movements of prices. Future uncertainty is now very great.

The author concludes from this that index-linking of long-term contracts, i.e. adjusting for price changes after they have occurred, is more satisfactory to both parties to the contract than to guess at a single fixed inflation rate and build that into the contract.

Part 2 discusses the issue of long-term index-linked government stocks. It demonstrates the uncertainty attached to fixed interest borrowing and lending, and the harmful effect on the future PSBR of the government’s present funding methods. The author discusses the Wilson Committee’s view on index-linking, and supports their suggestions of tax changes to make practicable the issue by companies of index-linked loan stocks. Index-linked house purchase loans are also advocated.

In Part 3 the author presents the advantages to life offices and their policyholders of policies with index-linked premiums and benefits, and discusses some of the complications of such policies, in particular the tax obstructions for certain types of policy.

In Part 4 the author suggests that index-linked pensions are both desirable and possible for all pension schemes, not only those in the public sector, though possibly they should start at a reduced level. Evidence is presented to show that “negative real returns” on ordinary share investment were a temporary aberration of the mid 1970s, and that in more recent years ordinary shares have shown very satisfactory real returns, which may very well continue. Ordinary shares have nothing to fear from index-linked stocks, and pension funds should be able to earn satisfactory real returns on any assets other than long-term fixed interest stocks.
Professor A. D. Wilkie, introducing his paper, said:—My paper this evening was presented first to the Institute of Actuaries almost a year ago, but it gives me great pleasure to present it this evening to the Faculty, from whose members I am sure it will receive critical and analytical, but I hope sympathetic, treatment.

The printed paper is exactly as presented to the Institute. However, the typescript foreword that you have too is a supplement, updating the paper for a number of facts in the past year.

The paper is divided into four sections. The first describes a statistical analysis I have carried out into past inflation rates, and is intended to be informative, although its conclusion, namely that it is difficult to find a satisfactory statistical model for forecasting inflation, is perhaps not unexpected.

The next three sections discuss index linking of financial instruments generally, index linking of life assurance and index linking of pensions respectively. These remain topical, but they imply that action should be taken by various participants.

The Government has already taken some action, by issuing two index-linked stocks last year. A third, 2.5% Treasury Index-Linked 2011 was announced only three weeks ago, and issued on 28th January. Like the first two stocks it was open to tender. The minimum tender price accepted by the Bank of England was 90, giving a real yield of roughly 3%. It is understood that not much stock was subscribed for at that price. Since then the market price of the stock issued has risen slightly to give a real yield of just under 3%.

I have repeatedly said that I cannot see the Government selling large quantities of index-linked stock to gross funds at yields of much under 3%. The comparison to be made is always with other real assets, such as property or equities. The dividend yield on the F.T.-Actuaries All-Share index is currently 5-65%. Now certainly ordinary shares are more risky than index-linked stock. The dividends may or may not grow fully with inflation, and may fluctuate in any case because of business conditions. Prices fluctuate around dividends, though at present they are rather low by historical standards, which show an average dividend yield of about 5%. Although one wants a suitable extra yield for the higher risk of ordinary shares, it seems that this does not need to be as high as 2.65%. In days of stable prices this would have been a rather high "yield gap".

Action then for the Government: accept that index-linked stocks need to be priced in relation to equities, and accept a suitable yield gap. Extend the restricted indexed gilts so that they can be held by anyone, just as with conventional fixed money gilts; they will be able to sell quite a bit to such holders at 3% yields or lower. Make it clear that index-linked gilts will be free of Capital Gains Tax; the 3% fixed interest stocks sold at a discount are a concession to high rate taxpayers anyway; you would be giving nothing away. Issue some longer stocks and some shorter ones; we could do with a 7-year short, and a 100-year long.

Finally, look at Government accounts on a properly inflation-adjusted basis. Inflation-adjusted accounts would show the public sector to have been in surplus rather than deficit for many years. Successive governments have, quite unnecessarily, cut their own capital expenditure and thus contributed to rising unemployment because of what looks to the outside observer to be a complete misunderstanding of its own accounting. It
would take too long at this meeting to go into the details of this argument, but the conclusion is: the Government should increase public sector capital expenditure, financing it from the issue of more index-linked stocks. This is not inconsistent with keeping a tight rein on the money supply.

Action is needed on the taxation front too: house purchase loans should receive tax relief, not at the standard rate on the interest content alone, but at say 15% on the total repayment of interest and capital. This could be run on exactly the same lines as life assurance relief. It would allow index-linked mortgages to be competitive in taxation terms. Next: alter the qualifying policy rules to allow index-linked premiums. Life offices may be reluctant to issue index-linked non-profit policies, but they could easily issue unit-linked policies with premiums linked to the Retail Price Index.

Action is required now from life offices: there are sufficient index-linked stocks for it to be possible to sell index-linked annuities to those who wish to buy them. Of course an index-linked annuity has a low starting yield, but it would still be competitive with index-linked National Savings Certificates, and give a higher immediate yield than ordinary share investment. Some self-employed people may choose to take part of their pension in an index-linked form. Some pension funds may be prepared to pay for index-linked benefits.

Then, more complicated but still possible: offer index-linked deferred annuities. These are not so essential for the large fund which can organise a build-up of contributions on a managed fund basis. But they would be useful for the self-employed or the small scheme.

Thirdly: devise conventional policies with index-linked premiums, and press the Inland Revenue to change the qualifying policy rules. We here all know that the one thing that can ruin life assurance business is excessively high inflation of expenses, with premiums fixed in money terms.

Now for those who run pension schemes: accept that pension schemes which do not provide index-linked benefits will be seen in the long run as not worth having at all. Decide whether to index-link pensions in course of payment to prices or to earnings; I would choose earnings, as being fairer and safer; but others may prefer a price link. Look at what the real yields on ordinary shares or property have been over the years, and don't be fooled by high nominal rates on fixed interest stock. These have no place in a pension fund portfolio except as a short term speculation. Then value wholly in real terms, avoiding any explicit assumption about future inflation. This is just another example of the traditional actuarial technique of immunisation: get the assets and the liabilities into the same "currency" in order to diminish the risk.

I have said enough about what I hope people will do. It is now up to the meeting to say whether they think these things can and should be done.

Mr. G. M. Dobbie, opening the discussion, said:—Although prior to 1970 inflation was not the significant factor it became during the seventies, I was interested to discover that the author had disclosed his interest in rates of inflation when contributing to a discussion on an economics paper by Professor Wilson 16 years ago in this Hall.

This most welcome paper tonight on indexing long term financial contracts commences with a section on inflation analysed for periods 1661 to 1980 and separately for 1661 to 1914 and 1896 to 1980. Clearly one could have thought of other subdivisions. However, I think the author's objective was to find periods which might be regarded as following some pattern. I personally felt that I could agree most with the author when he said in section 1.10 that the experience of this century, especially of recent
years, makes the uncertainty in forecasting very large. This, of course, is why the subject is important and the paper necessary.

The objective of the paper is, in fact, stated by the author in the last paragraph in section 2.7. In the section on the problems of falling inflation, guidance is given to the Bank of England on how to fund. Essentially, so long as institutions can sell contracts for which long term fixed rate stocks are appropriate investments, then experience tells us that a balance is struck—large amounts of interest are paid to the institutions who then voluntarily reinvest heavily in fixed rate Government stocks. However, if those who effect contracts with the financial institutions lose faith in the traditional contracts then other contracts will be offered by the financial institutions, and the demand for long term fixed rate stocks will diminish. As the author says, the possible consequences then include “persuasion” or rapid growth in money supply.

The issue, without restriction, of marketable index-linked stocks would allow Government finances to be put on a realistic footing with pension funds and insurance companies willing to subscribe for such issues while they accepted liabilities appropriate to that investment. I have suggested the use of the words “realistic footing”. I notice that there was a Bill in the House of Representatives last October “To issue constant dollar debt obligations”. The member of the house responsible argued that this would put Government finances on an “honest footing”, but the Treasury opposed the Bill according to newspaper reports on the ground that “it would undermine the creditworthiness of all Treasury debt.”

One cannot really avoid attempting to explain why we have had a different inflation experience this century from earlier experiences. Any explanation of inflation must cope with different countries, different political systems as well as different times. I would suggest that it is an important mechanism which attempts to satisfy the various claims between competing groups on the national economy; and sometimes the claims are external. The sharp increase in expected living standards has made it more difficult to satisfy these competing claims.

I examined the graphs of consumer prices, wholesale prices and producer prices published by OECD as economic indicators. The graphs of measures of inflation are shown for 19 countries—the measures available are different for different countries—and in 17 of the 19 the peak of inflationary pressures was around 1974/5. The only clear exceptions were Spain and Sweden. The thought did occur to me that it is possible that if a similar study on inflation to that in section 1 was carried out at the end of the century then 1975 might be the end of one of these periods into which the author divided the inflation data. But even if 1975 saw a peak in inflationary pressure the case for index-linked long term contracts remains. In today’s business world the customer is the important person and that includes the customer for long term financial contracts. He has now realised that the lender has generally had an inadequate return on many such contracts (viewed retrospectively). He has learned from his experience.

So I believe there is a significant force acting to encourage institutions to sell appropriate contracts and subscribe for index-linked stocks assuming they become available without restriction.

In the paper the author has often been bold in urging change. Amongst these can I comment on two:—

(i) That house purchase loans be index-linked, spreading the real cost of repayment evenly over the working lifetime of the borrower.
Superficially this is a very attractive concept but because it relates to the biggest decision many people make in their lives the practical aspects would require minute and understanding consideration. Particular attention would require to be paid to the mechanism for "trading-up" and to how repayment is to be effected at maturity. (ii) That only those pension schemes providing index-linked benefits receive Inland Revenue approval. Again this appears an appealing proposition in present circumstances and one which should place some of the costs of inflation on those who "benefit" or think they benefit, by urging inflationary policies.

In section 4.7 the author looks at the progress of real dividends over half a century showing a wide variation in out-turn depending on entry date. There are many difficulties in exercises such as this—for example, Government imposed dividend restrictions and changes in taxation systems. The uncertainties are such that loose expressions of a conclusion are the only ones to make. I did, however, despite the problems, look at progress of the real dividend over 1965 to 1980 in other stock markets. Over these 15 years the U.S. progress was certainly superior to our own with the Japanese clearly poorer, while the German record was comparable to our own.

Finally may I express my thanks for an interesting, though provocative paper with often bold requests for change. Thank you.

Mr. R. W. M. Baxter:—I should like to join with the previous speaker in thanking Professor Wilkie for his most interesting paper.

I think the most important point in the paper is to be found in the second paragraph of 2.5, where the author questions the traditional theory of matching liabilities with fixed interest assets. I agree with him that whereas it is possible for a life office, or a pension fund, to match a substantial part of its liabilities by investing in fixed interest stocks, this form of investment does not match the liabilities of the ultimate beneficiaries. Individuals require real assets which are capable of being converted into goods and services to provide for their needs.

It could be argued that if interest rates match inflation rates then it may be possible to maintain real values by investing in fixed money assets. However, this requires firstly that the assets chosen are short term assets, so that the yield matches current inflation rather than that which applied several years ago, and secondly that no tax is payable on the interest income. The investment by life assurance funds in long term fixed interest securities fails to satisfy either of these requirements. Long term fixed interest stocks are an inappropriate investment for an individual, so does it not follow that they are also inappropriate for an institution to hold on the individual's behalf? Of course, from time to time the holding of such stocks will turn out to have been profitable, as might any other speculative investment.

Index-linked stocks come closer to matching an individual's liabilities, and like the author I should like to see their scope widened to permit eligible holders other than pension funds. However, the choice of index to which the stocks should be linked merits further discussion. Earnings have risen faster than prices, so the Government appear to have been more cautious by linking the stocks to the Retail Price Index rather than to earnings, but in the event of some future disaster, for example another war, it could happen that over a lengthy period prices rose faster than earnings. It seems rather risky, and inequitable, that some group in the
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population should be protected from the financial effects of such disasters. It also means that a future Government will have a much greater incentive to raise money through income taxes rather than through expenditure taxes, although the economic situation at the time might indicate that the expenditure taxes were more suitable.

The use of the Tax and Prices Index would be less suitable than the R.P.I., since holders of stocks linked to the T.P.I. would be protected to an even greater extent from future disasters.

I suggest that consideration could be given to producing a new price index for linking purposes. This index would exclude all expenditure taxes which could be readily identified, e.g. VAT, customs and excise. The government could then pursue whatever fiscal policy it considered to be most appropriate without the need to consider its effect on index-linked debt.

Turning to the section on Taxation in 2.15, Professor Wilkie points out how the present taxation system is anomalous in that it ignores inflation. However he concludes that equity can be achieved without eliminating some of the major anomalies. I find this unsatisfactory. It is not equitable that an investor who receives interest should be taxed on the whole of that interest as though it were disposable income, when the reality is that the interest is predominantly compensation for the reduction in the capital value of his investment.

I should like to support a suggestion made by one of our members at the Institute discussion on this paper. This suggestion is that all interest payments should be tax free, subject to the proviso that the interest is in respect of a loan where the capital value is fixed in money terms. This would mean that the lender would not pay tax on the interest received and the borrower would not obtain tax relief on the interest paid.

Of course, interest does not exactly match inflation. There is a margin, sometimes positive, sometimes negative, and in theory this margin should be taxable. In practice the margin could be ignored, with any resulting inequity being much smaller than under the present system.

Finally, a thought about the eventual issue of index-linked life policies, once the qualifying rules are relaxed and the eligible holders of index-linked stocks extended to include life funds. A future policyholder with index-linked policies will need fewer of them than a present policyholder with traditional ones. Will fewer policies result in fewer people being employed in the life insurance industry?

Mr. A. U. Lyburn:—I have to agree with Professor Wilkie (albeit reluctantly) when he states in para 4.1, “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 even have been established”. However the fact is that occupational pension schemes have been established on a fixed money basis although some, and I believe now many, ameliorate the pensioner’s plight by granting increases either ad hoc or guaranteed at a fixed rate. The main problem then is to meet pensioners’ reasonable expectations without placing too heavy a burden on employers.

However I begin to part company with the author when he suggests (if I understand him correctly) that we have only to achieve a real yield of 3% to bring index-linked pensions within the reach of all. In fixed money terms that requires more than double the input for the same starting pension. Out in the reality of the market place that receives a chilly reception as does the alternative of one-third final pay pension index linked.
Something in between may be the ultimate answer and probably is but in the meantime we face an enormous task in educating the general public.

What worries me perhaps more is what appears to be the almost uniform acceptance of the suggestion that there can be no doubt that over an extended period in the future the real rate of return will be at least 3%. Now I certainly do not dispute that the past has relevance but I just do not believe that twenty years hence we will be able to look back and see a real rate of return of at least 3% for the last 20 years. First there is the change in social climate which I do not think is going to permit the "haves" to continue to exploit the "have nots"—perhaps that is expressed somewhat extremely but I would be unhappy to have this fear overlooked or unanswered. Second, it appears that the proportion of the working population permanently unemployed in future is more likely to rise than to fall unless and until there is a move to a 4-day working week. I appreciate this would not necessarily reduce the rate of real growth but could it not be a contributory factor in that direction? Third, and appropriately third, is the Third World which is rebelling more and more against exploitation and is increasingly buying our know-how and not our labour. Fourth, and this is another point about which I am not sure, what is going to be the future effect on us of the increase of American or Japanese control of so much of our new industry? Fifth, the conservationist lobby is likely to impinge more and more on real growth. You may now well ask what real rate of growth am I looking for. Let me quote from the Financial Times of 28th January 1982: "Indexed Poker with the G.B.—An offer of 3% real on a 30 year risk-free investment poses a bigger threat to pension fund managers' jobs than a million microchips. It compares according to Phillips & Drew's new pension book with 2.1% real on equities since the All-Share Index began in 1962." So 2% is my optimistic limit. If I happen to be wrong and it is only 1% all those pension fund clients who were hoping for 3% will have to increase contributions by at least 20% and also meet massive deficiencies and/or they will have to reduce pensions.

Some of you may have seen my next comment coming a mile off and if so I make no apology. If the real rate of return in future is going to be less than 2% it could be that the ½% differential (so dear to so many hearts) in calculating the contracting-out National Insurance contribution reduction will continue to be just about right.

On a different theme I would like to respond to some of the attacks on occupational pension schemes which to my mind are becoming unjust. After all over a reasonably short period of time we have moved from modest salary grade schemes costing less than 10% of payroll, or from money purchase schemes perhaps with total contributions of 10%, to final salary schemes costing as much as 20% to 25% of payroll where there is, say, 5% to 8½% escalation on pensions. So perhaps the next evolutionary move will be towards index-linked pensions of half or less final pay rather than two-thirds.

Mr. Dobbie has already referred to some of the author's provocative suggestions and in particular to two in paragraph 4.5, namely, that schemes should become wholly contributory and that index-linked benefits should be a prerequisite for SFO approval. My immediate reaction was to reject the first suggestion on administrative grounds but it has just occurred to me that if the two suggestions combined were implemented overall, that is by the public sector as well as the private sector, we could have a very neat solution to the present inequity between the pension benefits to the two sectors.
Mr. T. D. Kingston:—I am moved to speak not least because of Professor Wilkie's reference in his paper to the paper which Don Boden and I gave in this Hall three years ago on the effect of inflation on pension schemes. I would like to refer to section 4.6 where Professor Wilkie said that a "clear understanding of how inflation effects pension schemes was not universally demonstrated". When I took this up with him, he did say that he was referring perhaps more to the discussion than to the paper itself. He also expressed some surprise that we did not advocate a universal full index linking of pensions in the course of payment. Mr. Lyburn has referred already to some of the problems associated with full index linking; I will come back to that in a minute.

It is interesting to look back on the conclusions that we came to three years ago because time moves on and one would expect things to change somewhat. The first conclusion of our paper was that a real return on assets was possible, despite inflation. Time has added credence to that proposition, particularly since the issue of index-linked stocks last year. We estimated then that gilts should yield about 1.5-2.5% above inflation which indeed may be conservative in the light of comparison with current yields on index-linked stocks. Perhaps more importantly we advocated taking inflation into account specifically both in the valuation and in considering post retirement treatment of pensioners. Our proposals to make an explicit allowance for inflation in the valuation are, I believe, now slowly gaining ground. It is interesting that we also had a lot of discussion that night on whether it was better to use market value or discounted values for assets in a pension fund valuation. With the advent of index-linked stocks it must be very difficult to consider any form of discounting as a possible method. I don't see how it is possible in the same valuation to reconcile a discounting method for the value of conventional long gilts with a market value method for the value of an index-linked stock.

To return to the question which Mr. Lyburn has referred to—"What are we going to do about indexing benefits in existing pension schemes?" Mr. Wilkie has, I think, taken a very global view and said we should just do it. But clearly there are associated costs; it is fine for public sector schemes or for large prosperous companies to go in for full indexation but the truth of the matter is that there are an awful lot of companies which are either not wealthy enough or are too small to follow.

I think that it is important for people who are retiring in weaker or smaller schemes at least to be offered the option of taking part of their pension in index-linked form. Ultimately we may have to get to the point where we force people to take index-linked pensions but that is some way down the road. We have moved on considerably in the last few years, although a long way still from Professor Wilkie's counsel of perfection. I would like to join my voice to that of Mr. Lyburn in encouraging the education both of pension fund managers and people who are running pension funds in the need to take account of inflation.

Mr. K. E. Ayers:—Yesterday I read the transcript of the discussion at the Institute almost a year ago. One of the threads that ran through that discussion was the clear opinion of those who spoke that they required a real return of the order of 3% and, you will recall, at that time that the market had not given its verdict. I thought this was unreasonable—I felt at the time that 2% was much nearer the order of things and I am therefore very interested to hear Mr. Lyburn's remarks this evening. Indeed, I think, standing as we do now with the index-linked stocks yielding of the order of 3%, that a year ago the assembled company was wrong and I am right.
Why? The reason basically is that the real rate of return on other forms of investment has changed significantly over that period. It was in the course of change before that time but I would suggest that the real rate of return implied by most forms of investment over the last twelve months or so has increased by something of the order of 1%. Historically a 3% real rate of return has been extremely difficult, particularly in recent years, to achieve, and I would certainly suggest that were the definition of eligible holder to be widened then subject to the tax basis the net funds would be prepared to bid the rate of return down considerably lower, which would mean that the pension funds would have lost an opportunity that exists for them at present. There are, of course, difficulties in widening eligibility—the treatment of capital gains tax has been widely discussed over the past two months and has been mentioned briefly tonight. There is also the problem of opening the stock to overseas investors, who would thus be able to immunise themselves against some of the risks inherent in the currency as a result of the fact that part of the change in the value of a currency reflects the underlying inflation rate within that currency.

We talk about the yield but how are we to define this yield? Professor Wilkie, in his opening remarks this evening, suggested that the method of calculation should be independent of the inflation rate and that is something with which I wholeheartedly agree but I would make a plea for a common method of calculation to be accepted by the investment community at large. There are currently differences of as much as 30p or so in yield according to the method of calculation—that is 10% of the yield itself which are far too large. Part of the reason for this complication is that we have some of the information that enables us to calculate a yield as we traditionally understand a yield, but not all of it. We know the rate of interest to be paid during a period for a month or so before the start of that period since everything is eight months or so in arrear. We have the choice really—we can either use all the information we have, in which case the stock is not really an index-linked stock for the full period of its life since it is not index-linked for its last eight months. In this case the calculation of a yield requires an assumption as to the rate of inflation that will be experienced in that last eight months of the life of a stock albeit up to 30 years ahead. The alternative is to ignore the information that we have, and to make the assumption that a reasonable approximation to any rate of inflation is the rate of inflation that was applicable eight months earlier. I would suggest that, over a period as long as 30 years, this will produce fewer inaccuracies than the former method and I would therefore prefer the calculation to be done on this basis but again I would make a plea for a common basis so that at least we are all using the same yield at a given price.

Mr. J. D. Campbell:—After nearly a year's existence of index-linked gilts, what are some of the points or questions arising from the investor's point of view. I think to me the first question is "will the Government issue more index-linked stocks?" If I were in the Government I think I would recommend that they should, that is assuming that we must have Government borrowing at all. As David Wilkie mentions, the Government seem to be in a dilemma in its long term funding because, while its aim has been to reduce considerably the rate of inflation the Government would be punishing themselves in their achievement of this aim by making the cost of servicing the high coupon and high nominal yield debt extremely heavy. It seems an illogical, and even intolerable, position to be in I thought. By issuing index-linked stocks, the Government gains spread. On the one
hand if inflation falls that is good for the index-linked stocks from the
Government's point of view. If inflation rises then their traditional
securities are good from their angle. So I would think the Government's
mind would rest more easy under that realisation. If we call one year's
investment by the aggregate of pension funds and pension schemes in this
country at around eight or nine billion, then the issue of two and three
quarter billion of index-linked stocks within a year, which is what we have
had, seems quite a considerable demand on that cash flow.

The next point that was in my mind was that it seems that these index-
linked securities can really be issued only by the Government and not by
companies. I think there are several reasons for this. The tax environment
is adverse for companies; tax relief would need to be made available to aid
accumulation of a capital sum at repayment, but even more there is the
uncertainty of the open ended liability undertaken by the company—it
may be all right for Governments but I don't see how it can be undertaken
by a company.

My next point is that a 2.5-3% real rate of return sounds very like the
time honoured historic level of interest in periods of stable money. The
other area of indexed savings, namely national savings, return 0% real
or a fraction over. Clearly there are a number of reasons for the difference
between zero and three, but it looks like an anomaly.

At the least these index-linked stocks are another string to the pension
fund investor's bow. They do provide a yardstick by which to examine,
and think about, the relative value of other types of investment. I imagine,
if they are like me, that pension fund investors have scurried to consider
the return afforded by index-linked gilts in relation to the return from
traditional fixed interest, equities and property. I found the examination
of rates of return on equities set out in the paper informative and helpful.
These, and other similar examinations, try to point to long run real returns
on equities and property of, what shall we say, 4-6%. Perhaps we could
say, and I think David Wilkie has said it already tonight, the starting
yield plus the rate of inflation. Certainly 3% on the index-linked gilt
forces us to seek for more than 3% from equities and property. The new
gilt does seem quite a stiff competitor. It serves to underline the fact that
good timing of buying and selling, or if not selling then the point of valua-
tion, are very important to good performance or certainly to extra good
performance. Of course, relative performance, judgements and assess-
ments are made over one year and less, quarterly and in fact in practice,
of course, continuously. Not until maturity, many years ahead, will we
know the absolute return on an index-linked gilt but we are having to
assess its relative value all the time. The new gilt seems to compare in
nature to some extent to property investment. Property investment has
always been reckoned a basic hedge against inflation and also, with the
new gilt restricted to pension funds, it is rather a one way situation in
market terms so the marketability may be not all that free and of course
property's marketability really has to be tested in every case. In equities
it sometimes sounds a bit hollow, I think, to put a figure on the average
return over a period because of the very large swings in return from year
to year. When you have just had a -25% return over a period, it does not
sound all that convincing perhaps to say "never mind, the long run average
will be +5% or so". Still, you have to have faith, the same faith as others,
and certainly the timing is better at the lower level. Somebody described
the indexed gilt recently as cast iron but dull. Quite an interesting way
to put it but I think I feel it is not really very dull.

Finally, when we talk like this of indexing to inflation we are, I take it,
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referring to moderate inflation. I would like to think that's 0% to 5%. I suspect its 5% to 10% and maybe 5% to 15% in people's minds. If inflation runs away, which is always the fear with inflation, then I assume the Government will not then choose to meet its obligation on indexed stocks.

Mr. R. K. Sloan— I would like to concentrate my remarks on section 4 of David Wilkie's excellent paper, namely "index-linking and pension schemes". In this context, I am regarding the long-term financial contract as being one between the employer and the employee. The means whereby the employer seeks to finance this financial obligation is a slightly different issue, but obviously influences the degree of commitment, or benefit promise, that the employer is prepared to give.

In agreeing with the author that indexed pensions, whether fully or partially indexed, are a realistic proposition, I would just respond to his question in section 4.2 by stating my view that fixed real purchasing power pensions based on the Retail Prices Index would be my preference in meeting the needs of pensioners. In section 4.6, the author suggests the correct approach to funding as allowing for a 1% real rate of return relative to earnings during employment and a 3% real rate of return relative to prices in retirement. Compared with the typical assumptions currently used by many schemes offering non-indexed pensions, the author's basis will result in an increase of perhaps 60% in the funding rate, or indicated "cost" as the employer might term it. Therefore to the extent that funding rates of occupational pension schemes may be regarded as too low, then employers may have been lured into offering nominal benefits greater than they can really afford.

Furthermore, I would submit that these high levels of nominal pension could well be judged as excessive in overall benefit terms, including the basic State pension. I make no apology for returning yet again to the question of looking at pay replacement net of tax, pension and National Insurance contributions. On this basis, if we take a typical 60ths contracted-out final salary scheme that is not integrated with the basic State pension, then a married male employee with 40 years service will receive more than 100% effective pay replacement at all salary levels up to nearly £11,000 in today's terms. This benefit formula is of course that provided at our expense by the many public service schemes, which effectively have at least 75% of their total benefit, that is the 80ths non-commutable pension and the basic State pension itself, revalued in line with prices. So rather than attacking the existence of index-linking as such, to which like the author I do not object, surely we should make a start by pressing for a reduction in the commencing level of public sector pensions, probably by some form of integration?

In section 4.3 the author indicates an implied pay-as-you-go cost of 17% of total earnings for national pensions of two-thirds of average pay for men and one-third of average pay for women. On the basis of the author's "correct funding approach" to which I have already referred, I reckon that this same 17% as a funding rate, would require perhaps 30 years or so to build up a similar level of benefit on a funded basis. This illustrates clearly the dichotomy, given a fixed overall budget, between prudent long-term funding of gradually maturing benefits and the pay-as-you-go cost of higher immediate benefits.

Picking up several miscellaneous points made by the author, I find it disappointing that the pensions industry has in the past so often advocated the use of fixed money assets, in the form of insured pension schemes, to finance final salary pensions, and moreover costed on the unduly optimistic
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actuarial basis already referred to, namely one that appears to indicate a funding rate less than two-thirds of that required by a scheme offering fully indexed pensions. I also agree with the author’s comments on the important distinction between revalued average salary schemes and final salary schemes, since I believe that the career structure of the majority of employees would result in their receiving better benefits under the revalued salary approach. This is, of course, the basis of the new earnings related State scheme introduced in 1978 and indicates that it is perhaps not quite such an inferior product by comparison with existing final salary pension schemes, as the pensions industry at large tended to suggest.

To sum up, there is evidently a long way to go before all concerned with pensions fully appreciate what is and what is not possible in terms of index-linking. We need greater openness and honesty of presentation, which I regret I am not convinced our profession has yet done enough to promote in practice. Like the author, I believe index-linked pensions can be afforded, subject perhaps to the relative extent to which these are financed by the State, on its pay-as-you-go basis, and by private funding. However, target pensions in net terms must in many cases be reduced from their present high nominal levels, particularly in the public sector, to enable the cost of this long-term financial contract to be supportable by the economy.

Mr. J. R. Johnstone:—I very much welcome the issue by the Government of index-linked long term financial contracts and even more so the debate on them. I have two areas of concern.

Firstly, I do travel to Brazil fairly regularly and have done so for about 12 years and I know Roberto Campos who, as Minister of Finance, was responsible in 1964 for introducing their current cost accounting system including index-linked financial contracts. Any financial contract is defined as long term if it’s longer than six months and there were two factors there I think. Campos says when advising people from any other country that he would strongly recommend that indexed financial contracts should never be allowed to play too large a part in any country’s financing since once introduced it becomes in his view, virtually impossible to eliminate inflation thereafter and he ascribed Brazil’s failure to get inflation down below 15% after the introduction of linking very largely to the indexed system.

My second concern is the fact that, unfortunately, public sector borrowing requirements are defined by politicians and one of the great things about politicians is virtually everything that they do can be done in a relatively short space of time but if you once give them the ability to raise finance on what are apparently extremely easy terms, in a form which could never be undone, I think that this could lead to serious trouble for this country as a whole. The only other comment I would make is that somebody did refer to the Civil Service pensions being linked to prices rather than wages; I have a great regard for the strategic ability of the Civil Service and I suspect that having for a number of years had their pensions linked to the index that is rising faster they are going to be able to change over to the wage related index just as that starts on a long period of superior performance.

Mr. A. D. Shedden:—Throughout history lenders of money have not been popular; and public sympathy seems to lie with those who borrow money, even though they fail to pay it back, rather than with those who lend
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the money and who suffer from the borrower’s default. Through the nature of our training and employment we, as actuaries, are concerned for the lender’s interests and therefore owe a debt of gratitude to Professor Wilkie for campaigning for index-linked securities, because these will help lenders. Since his paper was presented to the Institute, the Government have issued index-linked securities. These will be welcomed by lenders as marking a withdrawal from the high risk fixed interest investments we have had in the past and a return to gilt edged investment. In the last year I have noted a greater acceptance of the index-linked philosophy outlined by Professor Wilkie: people talk more naturally about index-linking and have become more familiar with the adjustments which one makes when moving to an index-linked “currency”. For myself, it has been refreshing to return to my old actuarial tables and use interest rates as low as 2½% again.

Professor Wilkie has shown clearly that both industry and Government have failed to take proper account of inflation in their sums. This has become particularly and increasingly evident in relation to the tax system, as Professor Wilkie points out. I would support his comments regarding the inequity of taxing non-real capital gains or interest that is really capital. The capital gains inequity could be easily eliminated by some form of indexation, as is the case in the Republic of Ireland, but for interest the solution is more difficult. In the ultimate, one might not tax it at all but a compromise might be to tax it at a lower rate, perhaps at a quarter of the standard rate.

The concomitant of not taxing interest or taxing it at a reduced rate to compensate for the fact that a large proportion of interest is capital must be that tax relief on interest paid should be reduced also, as it would be under index-linking. We lenders of money, who lose out by having too much interest taxed, must think it remarkable that British industry complains so much of high interest rates when they in fact have been beneficiaries of the tax system enjoying tax relief on capital as well as interest. One wonders how British industry might have performed in the past had it had to account properly for interest and capital on an index-linked basis and been taxed accordingly.

No speaker has commented as yet on the design of life assurance contracts. Professor Wilkie rightly points out the constraints in policy design that spring from qualification rules and commission practices. In my view the qualification rules are the easier to deal with because the obvious commission solution, i.e. to have a flat rate of commission, would be unacceptable to most intermediaries. On the other hand, a simple change to limit the term over which premiums should be summed to 30 years would remove some present inequities in the 75% rule and make it easier to accommodate index-linked contracts. While it might be relatively easy to amend the rules so as to make them apply on an index-linked basis for both premiums and sums assured, a more general solution of the problem is required so as to allow not merely for inflationary increases but for certain other changes as well.

Professor Wilkie advocates index-linking annuities. The problem is of course that such annuities will have a much lower yield at the outset and annuitants in general seem unprepared to give up a high immediate income. Certainly, there has been no great interest in equity-linked annuities although this may be partly due to an aversion to possible extreme fluctuations in the amount of annuity payments. I agree with some of the other speakers that this is perhaps a matter for education and in time perhaps people will look upon this differently. The capital content rules should be
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made applicable to index-linked contracts so as to allow one to calculate the capital content by reference to the yields on index-linked securities. At present levels of interest rate the capital contents are too low and the effect is a taxation of interest which is really partly capital.

One final comment. Even with the availability of index-linked securities and the hope that in the long term properties and equities can be used as a proxy for these securities, I do not think companies can guarantee that in all circumstances a policyholder's investment with us will maintain its real value. Equities or property bought in 1973 would not have done this. Yields on index-linked securities will vary and could in theory be negative in certain circumstances. Thus we cannot undertake to index-link the accumulation of premiums paid—all we can do perhaps is to index-link the policy benefits. The price for such index-linking will of course depend on the economic situation at the time of payment of the premium.

Mr. I. M. Aitken:—Now that the Government has issued some index-linked stocks, I believe I can detect an aura of satisfaction in some financial circles. These stocks are seen as a panacea to cure all our ills.

I am, however, concerned about future inflation. Some Government in the future could very easily become complacent about the effects of inflation and this could lead to a very serious inflationary spiral. After all, the capital does not require to be repaid for a further 14, 24 or 29 years. Under traditional methods of funding, both capital and interest are effectively being repaid over the period, whereas under the new system, the capital retains its value and is only repaid on redemption of the stock. It is to be hoped that this new type of funding does not entirely replace traditional methods of funding.

If this index-linked stock becomes the modus operandi, it is possible that the demand for such stock would be such as to make other methods of saving increasingly less practicable. Hence, investment would tend to be more and more in the hands of the authorities—both local and central. If we have any confidence in this country, it is surely possible for the financial institutions to determine the price that is appropriate for a fixed interest Government stock. After all, this happens in the equity market.

Mr. W. M. Proudfoot:—I hadn't really intended to speak so if this does sound disjointed please forgive me. I was interested in this business of index-linking premiums under policies for individuals and as someone said earlier, it is all right for Governments to take on index-linked liabilities but perhaps not for companies and yet here we are thinking of asking individuals to take on an index-linked liability in the shape of the premiums. What about their ability to pay? What about persuading them to take on this liability in the future? It just so happens that in my own company in Australia where there are no qualifying rules because there is no life assurance premium relief, we do issue policies which have index-linked premiums, the premiums going up in line with the consumer price index. Now we only started to issue these policies in 1980 but the renewals of 1981 have been such that people have paid the increased premiums without much of a murmur. Of course the rate of inflation in Australia is much lower than it is here. The qualifying policy rules are the difficulty in this country and the difficulty is caused by life assurance premium relief. Now I am not suggesting that we do away with life assurance premium relief, but perhaps we could scrap all the rules if we extended the clawback period to a longer term and perhaps at the same time got rid of a great deal of the nonsenses that occur in this industry in this country.
Mr. J. M. G. Smart:—Does anybody else think as I do that neither Governments nor anybody else can guarantee to meet the liability implied in a stock, or pension or whatever, linked to a price index such as the R.P.I., and that such stocks and derived contracts should therefore be declared illegal? Impossibility of fulfilment is the millionth chance but (like the old problem of doubling the pay-off for each time a tossed coin comes down heads before it first comes down tails) it can happen. Why not stick to something which can reasonably be guaranteed, such as capital (and, if appropriate, income) increasing at, say, 5% per annum and the initial yield on the intended loan being calculated accordingly? The increase rate should not be more than the lender's lowest estimate of the average inflation rate over the term of the loan. The philosophy of those designing life assurance, pension and other long term financial contracts would be similar, leaving topping up to index levels to a proper ex gratia footing.

Incidentally, I would have thought that there was, and probably should be a fairly clear negative correlation between the real rate of return and the rate of inflation, and that at present inflation levels 3% real is historically very high indeed. I am astonished that there is so large a real rate of return on the present index-linked stocks.

Mr. A. P. Limb, closing the discussion, said:—The great delight of closing a discussion such as that we have had tonight is that no one else can contradict you except, of course, the author himself!

I would like to begin by adding my congratulations to those which others have voiced to Professor Wilkie for his extremely stimulating and topical paper. Inflation is perhaps the dominant financial problem of our age. It is that feature of our financial system which has made the idea of money as a store of value seem like a pipedream or a joke in the worst possible taste depending on one's frame of mind or perhaps whether one is a borrower or a lender. Government attempts to control inflation and the high interest rates which are associated with it have contributed, along of course with many other factors, to the high level of unemployment, which is surely the greatest social problem of our time. Without inflation there would be little need for a retail price index and no need to index long term financial contracts. By drawing attention to the arguments for and against indexing long term financial contracts which have been debated with much vigour this evening, Professor Wilkie concentrates our minds on the salient financial problem which faces the Government, every individual in this country and many professions and industries. The life assurance industry, the nature of which may well be transformed and not necessarily for the better if efforts to control inflation fail is most certainly included. I personally cannot share Professor Wilkie's enthusiasm for the widespread index-linking of long term contracts but like everyone here I am very much in his debt for bringing the subject forward for discussion at the Faculty today.

The first section of the paper traces the history of inflation for more than three hundred years and investigates most carefully whether or not statistical models, albeit fairly complicated ones, can be derived which may reasonably be expected to provide a reliable guide to the future progress of inflation or even a reliable description of its past history over extended periods. To my infinite relief Professor Wilkie concludes that no such models can be found. Whereas a particular model may fit particular sections of the period considered, the model which best fits one time span is found to be a poor guide for the next.
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I am relieved to find that this is so because it seems to me intrinsically improbable that any model will indefinitely fit the behaviour of a variable which surely must be the subject of many influences which are unforeseeable, for example the formation of power groups within society which may be expected to change from time to time. I confess to having grave doubts as to whether one can conceive of any model which would describe the value of inflation over the future. I believe that any such model implicitly attaches a probability to certain, we hope rather remote, possibilities such as, for example, the possibility that in one year out of the next ten we shall see inflation of 5,000%. I say this because it seems to me that if one runs any stochastic model a large number of times, one sees a distribution which presumably mirrors that implicit probability within the model. If I have understood procedures correctly and that is an accurate description of what is happening then I think we are led immediately to question whether such a model could ever be valid on the grounds that none of us here can meaningfully attach any sensible and defensible probability to such a possibility.

For me the most interesting section of the paper is section 2 which examines the arguments for and against the linking to a price index of long term securities. Many of the arguments in favour are, as the author acknowledges, set out in the Wilson Committee report. It has to be recognised that purchasers of fixed interest securities who have taken the risk that the high interest rates receivable in recent years would compensate them for the ravages of inflation have in general been disappointed by the outturn. Hence it is thought that savers who intend their savings to be stores of purchasing power would be in favour of index-linked instruments if these were in general available to them and no doubt they would. The author goes so far as to express the view that at some time investors will lose all faith in the Government's fixed money paper and the Government would be unable to fund voluntarily on any terms using fixed money instruments. Raymond Baxter argued that fixed interest stocks are fundamentally inappropriate to match policyholders' true needs, however suitable they may be to match the presumably unsuitable contracts which life offices have.

Further arguments relate to equity. It is thought only fair to protect the purchasing power of savers' capital and one may add that if index-linked securities were to become even more widely available than they already are in adequate amounts and with adequate spreads of terms to redemption then it would certainly be possible for private industry to provide index-linked pensions for its own pensioners and so vie with this benefit enjoyed by public service pensioners. We have heard a number of people this evening arguing that they could do so already but perhaps at funding levels providing lesser benefits than the public service pensioners enjoy. The arguments that it is unfair that only public service pensioners should be thus protected at the public's expense would then disappear. Everyone could be thus protected. The only residual question, although it might be a very considerable one indeed, would be the cost of providing such benefits for all pensioners. It can even be argued that since the lender has all too frequently lost out in the fixed interest market (and this is one of the most quixotic arguments I have heard), the borrower, principally the Government, must conversely have gained—well I agree with that—and hence if the Government had to face the discipline of borrowing on terms which give a real return to the lender, then the increased cost of so doing in the long term would curb Government overspending and hence help in the control of inflation. I find this argument incredibly optimistic.
but it has on occasion been used nonetheless. Mr. Johnstone argued more realistically and soberingly that shorter term considerations occasionally affect politicians' thinking.

The arguments against index-linking seem to me to be more telling from a national standpoint than the arguments in favour of it are from an individual's point of view. I believe myself that if widespread index-linking is made possible thus eliminating in large measure the discomforts of inflation from substantial sections of the population then the incentive to control inflation will inevitably diminish. Since I believe that inflation, although it may have some beneficial side effects, is in essence a cancer consuming an orderly financial system I am opposed to anything which I believe will diminish our chance of controlling it. Secondly, I believe that it must ultimately be impossible for a trading nation such as Britain to protect itself in its entirety against inflation and hence the exercise would in a national sense be futile and self deluding. If Britain were a closed economy; if financial transaction time was zero; if everybody were completely aware at all times of everyone else's actions and we lived in a dictatorship then it might be possible to index-link all financial contracts; but it would be completely pointless. The author himself admits that 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 author argues with disarming reasonableness that he is against inflation, not against inflation linked long term contracts. I daresay we are all against inflation but my own fear is that index-linked contracts, seductive although they undoubtedly are to some groups of the population, diminish our chance of controlling inflation. Mr. Johnstone quoted the case of Brazil, and I think he was speaking of the Brazilian Finance Minister if I understood correctly, who warned that inflation linked contracts if introduced on a widespread scale made the control of inflation virtually impossible when inflation became an endemic feature of the economy. Mr. Smart put forward the intoxicating idea of making the issue of index-linked stocks illegal—how splendid it might be to incarcerate the Chancellor! One may add that since the outgo to be faced by a Government in the early years of a gradual switch from funding by fixed interest instruments to funding by index-linked instruments is diminished, there must be the temptation to borrow more and leave the problem of repayment to be faced by Governments many years hence and this surely would be both irresponsible and undoubtedly inflationary.

The author goes on to consider other forms of index-linked instruments apart from gilt-edged securities. Index-linked mortgages are already available in a small way but for companies an index-linked stock is similar to the issue of further ordinary capital and not obviously more attractive. The author points out the inequities in our current tax system (a view echoed by Mr. Baxter and in inflationary times, Mr. Shedden) and I certainly support his views.

He goes on in the third part of his paper to consider the nature of contracts which might be issued and other matters relating to index-linked life assurance. It was very interesting to learn from Mr. Proudfoot that his office in Australia is already issuing contracts where premiums are linked to inflation. He told us that these had been running for only a short time. On the face of it, and here I think I'm arguing very much in favour of the author, it would be surprising if these contracts suffered a substantially different withdrawal rate from other contracts on the grounds that the burden on the policyholder in real terms is presumably not very different and indeed, in theory, not different at all from one year to the next.
I should be very interested to hear how they progress over the next five or ten years. Undoubtedly it is the case that if adequate index-linked instruments are available to life funds and provided the constraints of qualifying policy rules and, as Mr. Shedden points out, the little difficulties inherent in the commission structure are suitably modified, life offices will issue a range of index-linked assurances and annuities although I do agree that index-linked annuities require a great deal of faith in one's longevity by comparison with the fairly attractive immediate annuities of a conventional kind. Even those who fear as I do, that from a national point of view the issue of a wide range of index-linked securities is harmful, would accept that if they are available they should and will be used in the design of contracts.

Finally, the author turns his attention to index-linking of pension schemes—a section of the paper which has provoked a great deal of interesting discussion this evening. It is certainly the case that the trustees of pension schemes now may have the opportunity to purchase index-linked gilts which given an adequate spread of redemption dates are suitable investments for final salary pension schemes and will find it difficult to resist the argument that they should have purchased these securities if their investment performance falls short of that which could have been achieved by so doing. It would be one of the easiest forms of vindictive jobbing backwards the trustees would have to face, I would imagine.

There has been much discussion as to whether the return available on index-linked securities, at present approximately 3%, is over generous or not generous enough. I think the consensus view was probably that 3% is a very generous return indeed and presumably as a corollary we should be taking it whilst it is available to us. Mr. Lyburn agrees that fixed money pensions are unsatisfactory but points out, I think if I may say so very cogently, that the cost of inflation linked pensions is very unsatisfactory too. The real question at issue seems to me to be the transfer of real goods and services from the working population to the pensioners. If this transfer is refused and index-linked pensions have been promised then the result is either hyperinflation or the abrogation of promises that have been made. The sensible quid pro quo may be that index-linked pensions should be available but at a lower level. Either way, whether we are to pay more for the same level of pensions, but index-linked, or whether we are to accept a lower level of pensions, there is a massive education job ahead of the profession. I found Professor Wilkie's analysis of the inevitable contribution under the pay-as-you-go assumptions which he sets out in his paper for a final salary scheme a very sober and irresistible piece of reasoning and his suggestions for improvement as set out in section 4.5 of the paper which has received some comment this evening, equally stimulating and interesting. There has been no dearth of new ideas for the authorities to consider tonight. I hope that our author has found this debate as interesting and stimulating as I have found his paper. I can assure him that this evening we have all found it so and moreover we have enjoyed it.

The President (Mr. G. D. Gwilt):—It seems clear that the authorities—the Treasury, the Bank of England and the Government—think that inflation, which is now 12%, will go on at a high level for a long time. The reason for my saying this is that, even though they could issue more index-linked stocks, as Mr. Campbell agrees they should, they still continue to issue high coupon fixed interest stocks thus locking themselves in to high interest payments for a long time. If inflation were to come down the high interest payments continue but are not then offset by the expected depreciation
in the capital to be repaid. The Government have thus an incentive to keep inflation up if they sell too great a proportion of high coupon stocks.

Professor A. D. Wilkie, replying to the discussion, said:—I am very glad that the discussion really has shown so much understanding about the problems of inflation and the nature of index-linking. Some years ago, possibly even last year, it might have been harder to have a discussion of this standard. Speakers have, with one or two exceptions, accepted index-linking.

I think Mr. Smart and Mr. Aitken are worried unnecessarily. The real cost of repaying the index-linked debt is just the same as the real cost of repaying a low coupon stock would have been, or was, when there wasn’t much inflation. And yet, if inflation came down to roughly nil, would Mr. Aitken or Mr. Smart suggest that the Government ought not to borrow at all, because it was too unsafe to do so, and it might not be able to repay the debt? Was all the debt issued in the 19th century at varying rates like 2-5%, 3%, even up to 5%, all so totally unsound because prices might have fallen? In fact prices did fall over quite long periods, so that the real cost of repayment was higher than the original capital raised. Was that hopelessly unsound, and did that tend towards much higher inflation? I suppose that by 1960 it may have contributed towards much higher inflation, but it didn’t in the 1890s.

Mr. Lyburn was worried about the possibility that prices might rise in the long run, not simply because of inflation, but because of real shortages of goods. That seems to me a quite different situation. It hasn’t been a situation we have been in for the last thirty years. It might be the position that we would be in in the future, we really don’t know, but it is not obvious that it is certainly going to be the case. There will be pressures from other parts of the world, pressures from re-distribution of wealth within the country, one way or another, but it is not obvious that we are set for a long-term decline in real personal disposable income per head.

If we were having this same discussion in about the year 425 A.D., some years after the Roman legions had left this part of the world (anyway we wouldn’t be discussing the subject here, people would be discussing it in Rome) I think that one might then have said that linking to prices was going to be uncomfortably unsafe, so we had better link to earnings, because the economy is collapsing all around us. But that isn’t the situation at the moment, and it isn’t really likely to be the situation in Britain or in any of the Western European countries, I would have thought, in the foreseeable future.

Whether earnings would continue to rise in real terms as fast as they have in the last thirty years I don’t know. The rate of growth has been higher at some times than at others in Britain over that period, but it has also been much higher in some other countries than in Britain. Again, it
is possible that changes in society will mean that we have a much more rapid rate of growth of real earnings over the next twenty years.

There has been obviously quite a lot of discussion about pensions. To some extent this goes into too detailed a field for me to follow; the same thing applies to the discussion about the commission agreements and qualifying policy rules. I’m glad that those who are much more expert in these subjects than I am are talking in index-linked terms. My objective is to inject this method of realism into other people’s discussions, but not necessarily to follow them all the way there.

My example in the paper, which produced a funding rate of 17% to 20% or so, was meant to show that the real cost of pensions in the economy overall was not totally outrageous. It was certainly high, and indeed I should like to make one adjustment: I assumed in those calculations that the pension was two-thirds of gross salary, including pension fund contributions. But if you have a 17% or 20% pension contribution the pension is much more than two-thirds of your net salary. That takes up one of Mr. Sloan’s points that one ought to look at the net benefits that people are getting.

Mr. Shedden said that I was in favour of lenders: I wasn’t really trying to be in favour of lenders. I hope that inflation will reduce, and that the lenders will actually do rather badly out of this, but I fear that inflation might increase. What I am suggesting is not that one side, the lender, or the other side, the borrower, should have an advantage, but that both sides should be free to make contracts that are more satisfactory to both of them, whatever the outcome.

The market will eventually decide what the right rates of interest are to make these contracts fair to both sides, and the market seems to have fixed at the moment on 3% real on the index-linked stocks which, as I said at the beginning, seems to compare in the right sort of way with potential yields on equities. It also compares in the right sort of way with fixed interest rates at a time, not when inflation was nil, because it wasn’t nil—prices fluctuated quite a lot—but at a time when the expected long-run inflation was about nil.

Mr Shedden is happy to get back to the interest rates in older actuarial tables! Actually my problem was that I didn’t have any tables with high enough rates of interest, so I thought it a good idea to get back to 2.5% as well.

I am glad Mr Proudfoot’s company has issued policies with index-linked premiums in Australia. There could be problems with index-linked premiums if inflation was extremely high and wages changed differentially, so that some people didn’t get the corresponding wage increases, even though plenty of others did. But then there might well be problems in non-inflationary times with fixed premiums if people lost their jobs, and there are always reasons for people to stop their insurance policies as well as good reasons for continuing them. I personally would have been happy for some of my policies, not necessarily all of them, to have had their premiums automatically increased without my having to go to the trouble of thinking about whether they should or shouldn’t be increased and actually taking out new policies or failing to take out new policies.

Mr. Limb commented on the difficulties in fitting a statistical model to inflation. I thought that over the first long period from 1661 to 1914, which is over 250 years, the random walk model fitted quite reasonably (a random walk with a zero mean value). I think plenty of people at the time, if they had done the statistics, would have thought that that was a perfectly satisfactory way of explaining what happened in soundly managed
Indexing Long-term economies, particularly if you had a gold standard to rely on, because it was very difficult to get inflation unless you found an awful lot more gold.

There are ways I suppose in which things could simplify if inflation reduced. It was suggested by one speaker that if inflation was extremely high the Government would renege on the index-linked stocks. But if inflation really came down to zero what would the tax rates need to be to pay for the debt interest on the existing stocks, and where would the taxes most readily fall but on the holders of those fixed money stocks, whether they were pension funds or not?

In fact it wouldn't be impossible for a government simply to raise a wealth tax which was large enough to repay the whole of the National Debt at one fell swoop and say to investors "there you are, invest your money where you like, but it's not going to be with us". That's one way of getting round it, but I don't think that reducing the National Debt is actually what we would like to see at all. We like to find somewhere to carry on investing long-term money as an alternative to the other real investments, genuine ones, of equities and properties.

Professor Wilkie subsequently wrote:—It is useful to note that in his Budget speech on 9th March the Chancellor of the Exchequer, Sir Geoffrey Howe, announced that the three index-linked stocks already issued would be made available to any holders, and that a fourth, 2% Treasury Index-Linked Stock 1988 was to be issued. He also announced that the base values used in Capital Gains Tax computations would be index-linked for the future, and on a basis which omitted the first year's inflation. While I think that the rules for Capital Gains Tax, as they have appeared in the Finance Bill, are perhaps more complicated than they need to be, I am very glad that the Government has taken action so promptly on some of the points that I was suggesting.