ASSESSMENTISM—AN ALTERNATIVE TO PENSIONS FUNDING?

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1. INTRODUCTION

1.1. Occupational pension schemes in Great Britain and in many other countries are experiencing a very difficult period. For several years now actuaries valuing funded pension schemes have been faced all too often with the unenviable task of presenting to their clients the unpopular message that their pension schemes are going to cost more in the future than they did in the past. Furthermore, the increasing pressure to revalue pensions in course of payment and to replace withdrawal benefits by some form of preserved rights is either threatening employers with intolerable funding burdens, or is causing some departure from the established practice of fully funding retirement benefits.

1.2. Besides these problems, national pension schemes, which in many countries seem to be forever undergoing major changes, continue to be a source of controversy.

1.3. The actuary is faced with a dilemma: how can long-term viability and stability be maintained under circumstances where, on the one hand, the community is progressively demanding:

(a) adequate retirement benefits for all,
(b) protection of retirement benefits against inflation, and
(c) maintenance of accrued rights on change of employment,

and, on the other hand, rates of investment return continue to fall short of rates of increase in salaries and wages?

1.4. In France, funded occupational pension schemes have disappeared and been replaced by schemes operating by répartition or, to use the English equivalent, by assessment. After thirty years of experience with assessment schemes, French actuaries now see them as being a solution to our difficulties. Some are even incredulous that we are persevering with funding.

1.5. The reason that pension schemes in France are not funded, as they generally are in the Anglo-Saxon countries, is not that French actuaries have deliberately set about following a path opposite to that of their friends across the Channel. On the contrary, force of circumstances, principally the depreciation of investments during the Second World War and the subsequent social and political realities of restructuring the economy, caused the most expedient method of paying retirement benefits to be adopted. It was a lost cause for actuaries to insist on funding, and they were compelled to accept the situation and to apply their talents towards making the system operate successfully.

1.6. Having thus had assessment forced upon them and having also suffered
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scepticism from their colleagues outside of France, actuaries there now support the system wholeheartedly as being not only workable but indeed an admirable solution to the problem of providing retirement pensions to income earners of all kinds.

1.7. If a scheme is so simple as to use each year’s contributions to pay the year’s benefits, one may wonder why French actuaries continue to produce papers relating to these schemes, or even why actuaries are employed at all. The answer is that French actuaries continue to occupy a position similar to that occupied by life assurance and funded pension scheme actuaries for a century: they take the responsibility for investigating and continuously assessing the financial consequences of current and future requirements of their schemes, which, as in most other countries, are still evolving. Changes to the structure of the system and changing economic conditions can cause strains on the system, just as they strain life assurance and pension fund operations.

1.8. Although the assessment principle is simple, the practical problems of managing schemes so that benefit levels and contribution rates do not suffer random fluctuations, so that demographic, social or economic changes do not adversely affect the orderly evolution of the schemes, and so that new requirements can be successfully integrated, have all inspired a growing body of literature, investigation, experiment and experience.

1.9. The purpose of this paper is first to describe and explain an existing alternative to funded occupational pension schemes and to national schemes which are built around the occupational pension scheme situation, and secondly to provide a basis for constructive discussion of the applicability of this alternative to societies where funded schemes are currently the established rule.

1.10. In other contexts so-called real values often relate to values at constant prices, and many analyses of ‘real’ investment returns have been made by reference to price levels. It is worthwhile emphasizing, however, that in the context of pension schemes in which benefits are related to earnings, it is essential that all amounts, whether initial benefits, pension increases or levels of reserves, whether in funded or unfunded schemes, be measured in terms of salary levels and not price levels. Hence references made in this paper to real values as opposed to money values relate to values which are adjusted in accordance with changes in salary levels, not price levels (see also Appendix A).

2. PRINCIPLES OF ‘RÉPARTITION’

2.1. The fundamental principle of répartition, or assessment, is the well-known principle of apportioning each year’s contribution receipts amongst beneficiaries in accordance with some formula regarded as appropriate. The basic equation for an assessment scheme is commonly referred to as an equation of equilibrium and can be written as:

\[(1 - \theta) \sum_{i=1}^{A} C_i = (1 + k) \sum_{j=1}^{R} P_j \]  (1)
where \( C_i \) = the year's contributions from the \( i \)th contributor
\( P_j \) = the year's pension payments to the \( j \)th pensioner
\( A \) = total number of active persons, i.e. contributors
\( R \) = total number of retired contributors, i.e. pensioners who are former contributors
\( 0 \) = proportion of contributions required to meet expenses
\( k \) = average ratio of pensions of surviving spouses and children to pensions of retired contributors.

2.2. Because contributions are not retained and invested but instead are disposed of as benefits, there can be no identification as in some funded schemes of an individual's contributions with his eventual benefit payments. Nevertheless, his benefits can be determined by reference to the contributions paid by him, within the constraints of the total amounts available at the time to pay benefits. Alternatively, the scheme can be operated as a benefit promise scheme in much the same way as in most modern funded schemes, the rate of contribution being adjusted as required to maintain the desired level of benefits.

2.3. The simplest formula for determining benefit payments each year is to divide the total amount available equally amongst all beneficiaries. Clearly many formulae are possible, and in practice the simplest method adopted in France is to divide the amount available in proportion to the number of years worked by each beneficiary (this method applies in the scheme for miners, where salaries have always been approximately uniform). In the national basic scheme for salaried employees in France, the formula is similar to that to be used under the new British legislation. Initial pensions are calculated in proportion to the product of the number of years of service and the ten best years of revalued salary (i.e. salary revalued annually according to a salary index). In most other schemes in France, initial pensions are proportional either to total revalued career salary or total revalued career contributions. Benefits prescribed by either of these latter methods are commonly referred to as benefits specified in points.

**Assessment by points**

2.4. Assessment schemes by points are schemes which use a point as a parameter to compare a member's contributions each year with a reference salary for the year (usually some form of average salary, or a fixed proportion thereof). The reference salary therefore represents a salary index.

2.5. In a scheme operating by points and charging a contribution rate of \( c \), if \( s \) is the reference salary for a given year and \( S_i \) is the salary of the \( i \)th contributor, the number of points \( q_i \) attributed to him in the year is equal to \( cS_i/s \). His contributions \( C_i \) are equal to \( cS_i \) so that \( C_i = cS_i = q_is \).

2.6. As contributions are always reckoned as a percentage of salary, if the contribution rate remains constant the number of points acquired is a measure of the member's salary relative to the reference salary. On retirement the number of points acquired by the contributor throughout his career is totalled, and
during retirement his pension each year is equal to the proportion of the total amount distributed as pensions which his number of points bears to the total number of points acquired by all beneficiaries receiving pensions during the year.

2.7. It will be recognized that if the contribution rate always remains constant and the method of calculation of the reference salary remains consistent, pensions will be proportional to total career salary calculated in real terms, i.e. to total revalued career salary.

2.8. The mechanism used to calculate the pensions actually payable each year is to specify in advance the value of a point. This value is the amount of pension for the year, expressed in currency units, which corresponds to one point. If the value of a point remains constant each year, each beneficiary's pension remains constant. In practice this does not occur, although one of the constraints usually applied in making projections is that the value of a point must never decrease.

2.9. In general terms, if the ratio of the number of contributors to the number of pensions (known as the demographic ratio) remains constant then, when salary inflation is occurring and all other things remain equal, contribution receipts will grow in proportion to salaries, allowing pensions to increase in the same proportion. In this case the value of a point will have been increased in proportion to salaries. Hence one of the most important attributes of assessment by points: automatic revaluation of pensions at rates related to the rates at which the average salaries of scheme members increase.

**Equation of equilibrium**

2.10. In a scheme operating by points, if \( n_j \) is the number of years during which the \( j \)th pensioner paid contributions, the total number of points \( q_j \) attributed to him during his career will be

\[
\sum_{t=1}^{n_j} q_{jt}
\]

If the value of a point is \( p \), the amount of his pension for the year will be \( p \cdot q_j \). Hence the equation of equilibrium becomes:

\[
(1 - \theta) \sum_{t=1}^{n_j} q_{jt} s = p(1 + k) \left[ \sum_{j=1}^{R} \left( \sum_{t=1}^{n_j} q_{jt} \right) \right]
\]

Now let \( \bar{q}_a \) be the average number of points acquired per contributor during the year, \( \bar{q}_r \) the average number of points acquired by all existing retired contributors during each year of contributory service and \( \bar{n} \) the average number of years during which they contributed. Recognizing that all terms in equation (2) are functions of time but assuming that \( \theta \) and \( k \) remain constant, equation (2) can be rewritten as:

\[
(1 - \theta) \cdot A(t) \cdot \bar{q}_a(t) \cdot s(t) = (1 + k) \cdot p(t) \cdot R(t) \cdot \bar{n}(t) \cdot \bar{q}_r(t)
\]

This is the most useful form of the equation of equilibrium for a scheme operating by points.
Rendement or return

2.11. A contributor to a pension scheme, whether it be an assessment scheme or a funded scheme, can be regarded as receiving a return, in the form of a pension, in exchange for the contributions paid by or for him. In a funded scheme a contribution of one currency unit made on retirement at age \( r \) would normally attract a pension of \( 1/a_r \) units, where \( a_r \) is the present value at age \( r \) of an annual pension of 1. The (rate of) return is therefore \( 1/a_r \). In an assessment scheme by points, a contribution of one unit made on retirement would be worth \( 1/s \) points, and would thereby attract a pension of \( p/s \) units, so that the (rate of) return is \( p/s \).

2.12. The concept of return (rendement in French) can be explained this way only for a contribution made at the point of retirement because a contribution made at any other time would not normally be commensurate with it. More generally, a contribution paid to a pension scheme (either assessment or funded) can be regarded as giving rise to a benefit entitlement through the medium of a contribution rate. This rate may take account of an individual contributor's age or it may be established on a collective basis for all contributors irrespective of age. It may also take account of other factors such as expected future salary levels and, in the case of funded schemes, expected future interest earnings. The return in an assessment scheme by points can be regarded as the pension entitlement (expressed in real terms) granted for a contribution of one unit on the basis of a uniform collective contribution rate.

2.13. It is noted that in assessment schemes values in different years are compared by measurement in salary terms, whereas in funded schemes they are compared by measurement in money terms adjusted for interest.

2.14. In an assessment scheme by points, the return is a highly convenient dimensionless parameter which serves to compare one scheme against another and also to compare the performance or state of a particular scheme in different years.

2.15. Having introduced the return as a conceptual entity, it remains to define it precisely. There are, in fact, several different definitions which all lead to different parameters, each of which specifies a different aspect of the same scheme. The four main notions of return, using the terminology of equation (2a), are the following:

- **Equilibrium return** \( r_e(t) \): return such that the equation of equilibrium is satisfied. Rearrangement of equation (2a) gives two expressions for the equilibrium return:

\[
  r_e(t) = \frac{p(t)}{s(t)} = A(t) \frac{q_a(t)}{n(t),r(t)} \frac{1 - 0}{1 + k} \tag{2b}
\]

- **Demographic return** \( r_d(t) \): return based on demographic factors only, ignoring financial ones:

\[
  r_d(t) = \frac{A(t)}{n(t) \cdot R(t) \cdot (1+k)}
\]
Ultimate return $r_u$: the predicted ultimate value of $r_e(t)$, implying the future existence of a stable population and the stabilization of financial factors.

Actual return $r_a(t)$: the return actually in use at time $t$. It may or may not vary with time.

2.16. Comparison of the equilibrium return with the actual return each year will indicate the extent to which reserves have been augmented or depleted during the year. Projections of the demographic return, which is generally a parameter of the scheme beyond the control of the scheme's management, will serve as a basis for projecting contribution and benefit requirements. There are also other kinds of return which occur in practice, for example a reference return which is used in calculating transfer or compensation payments between schemes (q.v. § 2.23 ff.).

Management of a scheme operating by points

2.17. Money amounts associated with assessment schemes are in principle incidental to their operation. In so far as these schemes adjust automatically to changing money values, they can be described as dynamic systems. The same cannot be said of funded pension schemes in which money values are always of prime importance, owing to the nature of most investments. This dynamic aspect must, however, be carefully controlled if an assessment scheme is to evolve smoothly, without risk of failure and with minimal changes to contribution rates and to relative benefit levels from year to year. In this context, it is evident that changes in any of the terms of equation (2b) will affect the equilibrium return $r_e(t)$ and the equilibrium value of a point $p_e(t)$.

2.18. Much of the literature on assessment schemes is related to the survival of these schemes, but the main principles of their successful management could be summarized as follows:

(a) Extend membership of the schemes to as much of the working population as possible.
(b) Ensure that membership is compulsory and permanent for all classes of persons eligible for membership.
(c) If there is more than one scheme, institute a suitable form of annual transfer or compensation payments among schemes so that the net resources available to meet pensions in each individual scheme reflect as far as possible the national ratio of active persons to retired persons.
(d) Taking into account demographic projections, work-force projections and any other matters which could affect the relative future levels of contribution receipts and benefit claims, select and apply in advance an actual return $r_a$ for each future year such that pension levels will evolve smoothly and that sufficient funds will be available at all times to meet pension payments.

Each of the notions of return described in § 2.15 has its place in the implementation of these principles.

2.19. Principles (a), (b) and (c) above are encompassed in the concept of
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national solidarity, implying the apportionment among all the non-active of the nation of some of the productivity of the active part of the population. As is well recognized, in addition to this kind of horizontal solidarity, successful perpetuation of assessment schemes necessitates continuation of a solidarity, in the form of transfer of resources, between generations.

Assessment without points

2.20. As explained previously, assessment by points means apportioning net contribution receipts in proportion to revalued total career salary or contributions. Other methods are obviously possible, and several are in use in France. The most common alternative to using points is to partition available funds in proportion to the product of the number of years of service and a defined salary. As with funded schemes the defined salary may be final salary, average of the last one, three or ten years' salary, or some other selected salary. In virtually all French schemes which use an average of more than one year’s salary, calculation of the defined salary involves revaluing salaries for past years according to a salaries index—this exemplifies perhaps the extent to which the French have discarded money values in relation to pension schemes.

2.21. Schemes operating on a (revalued) final average salary basis usually define the initial pension as a fixed percentage of the defined salary per year of service, in just the same way as is done in most funded pension schemes. How can these schemes maintain a level of pension increase commensurate with salary increases and still truly remain assessment schemes? First, the proportion of salary per year of service is generally determined in conjunction with the contribution rate, such that the initial pension will approximately correspond, on average, to the pension expected to arise in a points scheme. Secondly, a single rate of increase for all pensions would be calculated in advance each year (or perhaps more frequently) on the basis of expected total net contribution receipts and total relative pension entitlements. Equations corresponding to this approach are set out in Appendix B.

2.22. In practice not all schemes in France remain pure assessment schemes. There are some schemes which maintain their equilibrium not by apportioning expected net contribution receipts but by obtaining sufficient subventions from the scheme’s guarantors to meet agreed levels of pensions and pension increases. There is a distinction, however, between pure assessment schemes which may be temporarily unable to meet their commitments—such schemes having no financial guarantor—and pay-as-you-go schemes where no attempt is made to balance normal contribution income against expenditure. Successful management of schemes having no financial guarantor is the real subject matter of investigations into the characteristics of assessment schemes.

Compensation

2.23. Compensation or transfer payments within a group of schemes, where each scheme serves a part of the working population, are necessary as a
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part of inter-occupational solidarity. In France compensation is regarded as a social necessity, for it serves to equalize the effects of the disappearance of some companies and the appearance of others, the contraction of some industries and the expansion of others, along with other aspects of the evolution of the economy and technology of the society.

2.24. The method of compensation can be straightforward if all the schemes making transfers operate under exactly the same set of rules. Where the rules of the schemes differ, compensation can be carried out in accordance with a principle agreed among the schemes involved. Implicit in the principle adopted will be a particular concept of equity to be achieved by the compensation arrangements. The principle adopted may also introduce distortions by favouring some groups of contributors or pensioners over some others. As with other aspects of balancing benefits against contributions, compensation is a year by year operation.

2.25. One possible method of compensation is based on the principle that all pensioners should receive a pension corresponding to a certain reference pension. If the reference pension is $P$, the amount of compensation $X_i$ paid to or from scheme $i$ would be calculated from a formula such as the following:

$$X_i = P A_i \Sigma R_i / \Sigma A_i - P R_i$$

where $A_i$ is the number of active contributors in scheme $i$ and $R_i$ is the number of retired persons receiving pensions.

2.26. Under this method, which is demographic only, the earnings-related aspect of benefit entitlements is not applied to compensation, implying a desire for some kind of equality of pensions irrespective of salary levels. This method can result in a scheme whose members have low salaries paying compensation to the members of a scheme whose members are highly paid. If, however, the reference pension is sufficiently low the basic objective of compensation, which is to compensate schemes for adverse demographic ratios, can be satisfactorily achieved.

2.27. An alternative method of compensation is based on the principle that the actual return $r_i$ in scheme $i$ should be equal to a given reference return $r_r$, which may or may not equal the equilibrium return for the participating schemes taken as a whole. (The method requires that an actual return can be specified on a comparable basis for each participating scheme. The return in a scheme which does not operate by points is discussed in Appendix B.) The amount of compensation $X_i$ paid to or from scheme $i$ would be calculated from a formula such as the following:

$$X_i = r_i C_i \Sigma (P_i / r_i) / \Sigma C_i - r_r P_i / r_i$$

where $C_i$ is the amount of contributions received by scheme $i$ during the year, and $P_i$ is the amount of pensions paid during the year.

2.28. Compensation payments calculated each year by this method will reinforce across all the participating schemes the earnings-related aspect of
benefits. If the rates of change of reference salaries $s_i$ vary in the different schemes, the method will result in greater compensation payments to the schemes where the reference salary rises fastest (because $r_i = p_i/s_i$, $p_i$ being the value of a point). This difficulty is eliminated if the reference salary rises uniformly for all schemes, which can be achieved if both the reference return and the rate of change of the reference salary are prescribed.

Preservation and past service rights

2.29. The preservation of rights on change or cessation of employment, and the granting of benefits in respect of past service, are discussed in §§ 5.3–5.7.

3. THE FRENCH SITUATION

3.1. Pension schemes in France exist primarily to pay age retirement benefits. In most schemes the normal retirement age is 65, with early retirement on a reduced pension down to age 60 or age 55, and in some cases late retirement on an augmented pension. The retiring age of 65 is currently under discussion amongst unions, employers and the Government and may be eventually reduced to 60. Invalidity benefits are not payable although contributors found unfit to work after age 60 can usually be granted a full pension. Death benefits are limited, generally by the existence of an age such as 55 or 50 below which surviving spouses' pensions are either not payable or payable only if the spouse is a widow with two or more dependent children.

3.2. Invalidity benefits are not included in pension schemes but are generally covered, within limits, by the Caisse Nationale de l'Assurance Maladie (CNAM) which is the sickness, accident and medical branch of the social security system. Invalidity pensions are sometimes supplemented by employers who may have insured under a funded group insurance policy. Invalidity pensions are, however, temporary pensions because they cease as soon as the age retirement pension becomes payable, perhaps at age 60 and not later than 65.

3.3. The age retirement system is effectively a two-tier system, the first tier currently providing retiring employees with pensions not less than a certain minimum, and up to 50% of a defined salary limited by a ceiling. In 1976 this salary ceiling was 37,920 francs per annum, which can be compared with the 1976 legal minimum wage of about 16,500 francs.

3.4. In contrast to the normal situation in Anglo-Saxon countries, where each occupational pension scheme is operated by a single employer, the French system is characterized by schemes catering for the members of one or more occupational groups, usually covering more than one employer (and in some cases covering hundreds of thousands of employers).

French pensions in 1976

3.5. The French system of pension schemes appears complicated as a result of its historical development. The first tier of the system, although now almost
universal, consists of not one but several basic schemes. Membership and hence benefit entitlement is not a right of citizenship, as in some countries, even though a minimum flat rate pension is guaranteed to all citizens. Entitlement to benefits depends on the member being or having been a member of the work force.

3.6. This first tier of basic schemes is dominated by the Régime Général or General Scheme, which covers in principle all industrial and commercial employees not covered by special schemes. There is a separate scheme for agricultural employees, and the special schemes cover civil servants, the defence forces, other State employees, miners, merchant sailors and certain public and other enterprises such as the railways, electricity and gas, and the Bank of France.

3.7. The benefit formula in the General Scheme provides for a pension at age 65, for each year of service up to 37½, of 1 1/3% of the average of the ten best years of revalued salary, yielding a maximum of 50% of the defined salary at age 65. The corresponding benefit at age 60 is 25% of the defined salary.

3.8. Several schemes exist to cater for self-employed persons, the majority of whom belong to one of four schemes which operate separately for small industrial enterprises, for the skilled trades, for the professions and for farmers.

3.9. In 1974 the General Scheme had 16·1 million contributors, the special schemes 3·6 million, the agricultural employees scheme 8 million and the schemes for self-employed persons 3·9 million. Thus, in a total population in France at that time of 52·4 million, 24·4 million were contributing to the basic schemes.

3.10. The second tier consists of a set of complementary pension schemes, providing benefits complementary to those of the General Scheme. Almost all contributors to the General Scheme now contribute also to a scheme associated with the Association des Régimes de Retraites Complémentaires (ARRCO), which is an association of schemes which co-operate with one another in providing a certain minimum level of benefits. For one large group of employees known as cadres (generally management and other professional or semi-professional staff), benefits above the Social Security ceiling are provided not through an ARRCO scheme but through a scheme associated with the Association Générale des Institutions de Retraites des Cadres (AGIRC).

3.11. ARRCO groups together some forty-one institutions, each of which is a scheme in its own right with its own rules; most of these institutions operate by points but some do not. Under the aegis of ARRCO, as administrative co-ordinator, each institution is required to conform to certain minimum contribution rates and, partly as a consequence of the compensation arrangements, to comply within limits to certain benefit levels related to these minimum contributions.

3.12. ARRCO benefits are related to contributions on earnings up to the Social Security ceiling for contributors to the forty-one member institutions and also for contributors to AGIRC and certain other relatively small complementary schemes. For members of the ARRCO institutions, which embrace more than 1 million employers, contributions are also paid on earnings up to three times the Social Security ceiling at the same minimum rate as for earnings
below the ceiling. Consequently, benefits provided by ARRCO serve a dual function: to supplement benefits from the General Scheme in relation to earnings below the ceiling, and to complement these benefits for persons who have higher earnings. The minimum ‘contractual’ rate of contribution with ARRCO is 4% of earnings, and for this contribution benefits are generally of the order of 20% of salary for a full career.

3.13. In principle membership of ARRCO in relation to earnings below the Social Security ceiling is now largely coincident with membership of the General Scheme. At the beginning of 1975 there were approximately 16 million contributors to the General Scheme of whom 14½ million also contributed to institutions associated with ARRCO. About 1½ million of these represent the AGIRC contributors (i.e. they contribute to ARRCO in relation to earnings below the ceiling and to AGIRC in respect of their earnings above the ceiling).

3.14. The AGIRC group provides its members, who are salaried persons classified as cadres, with complementary benefits in relation to salary earned in the range of from one to four times the Social Security ceiling. A person given the status of cadre automatically becomes a contributor to an AGIRC scheme. All of the member schemes have the same rules; they operate by points and have the same reference salary, same point value and therefore the same return. Contribution rates can, however, differ as between schemes; the minimum rate is 8% of salary, the maximum rate is 16%, and the average rate in 1975 was about 14%. At the average rate, benefits for a full career are currently of the order of 70% of the segment of earnings on which contributions are made.

3.15. Most of the special schemes referred to in § 3.6 do not utilize the Social Security ceiling, and can therefore be regarded as encompassing for their members both tiers of the system as it relates to other income earners. Benefits in these special schemes are in most cases more generous than in other schemes, chiefly as a result of provisions won before 1939 and always guaranteed by the State.

3.16. There is a third tier of schemes, analogous to the top-hat schemes known in Britain, providing supplementary benefits to some employees whose salaries exceed the AGIRC ceiling. These schemes are relatively unimportant.

**The emergence of assessment**

3.17. In 1930 a contributory social insurance scheme was instituted by the French Government as a partially funded national age retirement scheme for employees. Between 1941 and 1945, a period when the franc was depreciating rapidly, the Vichy Government attempted to improve benefits, and the process of achieving this involved substantial diminution of reserves (both in francs and real terms), resulting in the appearance for the first time of a scheme operating solely by assessment.

3.18. Instrumental in the abandonment of funding was the excessive depreciation of the French franc, which in 1946 was worth less than one-fifth of
its 1939 value. Investments held before the war consequently became virtually worthless in face value, and offered only a token real income. As is well recognized, funding, once abandoned, cannot easily be retrieved, and so in re-organizing and improving the social security system in 1945, the French Government reconstructed the national scheme on a basis which consolidated the assessment mechanism.

3.19. The new national scheme, called the General Scheme, was intended to cater for all income earners, although large sectors of the working population, in particular all self-employed persons and all agricultural workers, succeeded in rejecting the Government’s policy that they participate in the scheme. The cadres were therefore drawn into the General Scheme but, since it contained a salary ceiling applying to both contributions and benefits, the cadres were given the right to negotiate with their employers an arrangement for additional benefits to supersede the substitute schemes of which they had been members before the war. These negotiations resulted in a ‘Collective Agreement’ signed on 14 March 1947 between the national council of employers—the Conseil National des Patronats Français (CNPF)—and three unions. This Agreement, which created AGIRC, represented the birth in France of pensions by assessment in the private sector. The scheme was complementary to the General Scheme and it initiated a system of pensions by points. Furthermore it envisaged the regular adjustment of pensions; this was not instituted in the General Scheme until the following year.

3.20. By the time AGIRC had been operating ten years, various other employee groups had begun to show interest in instituting assessment schemes to complement benefits from the General Scheme. Numerous schemes began to appear in the late 1950s, and it soon became evident that the growth and the stability of these schemes would need to be regulated in some way. On 8 December 1961, an Agreement was signed between the CNPF and the main unions. The Agreement begins as follows (author’s translation):

The signatories in considering:
— the general movement which for several years has been expressed by the development of complementary pension schemes instituted for salaried personnel in the private sector and arising in response to a social need;
— their common concern to prevent the movement from evolving in a disorderly fashion, which would be detrimental to all.
Affirm their will:
— on the one hand, to ensure the stability, security and perpetuity of complementary pension schemes for salaried persons, this being the common objective of the signatory organizations;
— on the other hand, to support all measures likely to promote appropriate co-ordination and compensation among existing pension schemes.

3.21. This Agreement, while specifying its field of application, applied only to groups of employers and employees associated with the signatories. The following year the Agreement was recognized by a ministerial decree which, under French law, had two important effects. First it automatically and compulsorily
extended the Agreement to all employers and employees falling within its field of application, including those not affiliated with the original signatories; and secondly, it meant that ministerial approval would be required before any proposed amendments to the Agreement could be compulsorily introduced. This obligation to conform to the Agreement has enabled the pension schemes to recognize earlier periods of service of employees, even if their former employers no longer exist.

3.22. The Agreement thus established ARRCO, and by the end of 1962 it covered more than 6 million contributors and more than 1 million pensions. Ten years later there were 10 million contributors, and, with the progressive integration as from 1 January 1974 of contributors to AGIRC and other schemes, by the end of 1975 total contributors registered with ARRCO numbered approximately 14½ million (see also §3.13).

3.23. The basic schemes for self-employed persons, particularly the three major ones catering for small industrial and commercial businesses (ORGANIC), skilled tradesmen (CANCAVA) and farmers (CNAVMA), have evolved less easily than AGIRC and ARRCO, for they suffer from the administrative difficulties usually associated with compulsory schemes for the self-employed. These difficulties, characterized by a reluctance to pay contributions and the consequent attempts to avoid membership or understate income, are likely to have been exacerbated by the inter-generational aspect of the assessment system.

3.24. ORGANIC and CANCAVA have been aligned with the General Scheme since 1 January 1973 following a change from benefits determined under a points system (which carried its own equilibrium level of pension increases) to the formula of the General Scheme. Pension increases are now at the same rate as in the General Scheme, and as a consequence of their relatively unfavourable demographic structure, these schemes now have to be supported by compensation from the General Scheme and by other contributions arranged by the State.

3.25. The change in 1973 to a guaranteed benefit level should have ameliorated the difficulties of ORGANIC and CANCAVA, but it seems that the substitution of a ten best years’ salary for the revalued career salary represented by the former points system has served to displace rather than eliminate the difficulties. The traditional nature of many of the enterprises involved, wherein a son will take over the business when his father, the contributor, retires, often results in lengths of service in these two schemes being short. This would not be a problem if the son had previously been contributing to the General Scheme as a salaried worker, but in fact that has too often not been the case.

3.26. CNAVMA has had to face not only the normal problems of schemes for the self-employed, but also the relatively low cash incomes of many of the farmers, frequently combined with the need to provide benefits for the family as well as the farmer himself. Benefits under the scheme take the form of a basic flat rate pension, equal to the minimum pension for salaried workers,
supplemented by another pension determined by a points system. In practice farmers’ contributions have always been low and the scheme has always been heavily subsidized by the State.

3.27. The basic scheme for agricultural employees has also been aligned with the General Scheme. For political reasons it maintains a separate identity and its own administrative organization, although it could in principle be absorbed by the General Scheme.

3.28. Compensation payments between the various basic schemes are determined in relation to the average pension required to be paid in the scheme offering the lowest average pension; this is the farmers’ scheme. At present it is only the General Scheme, being the scheme with the most favourable demographic position, which makes payments out under this arrangement; all the other schemes are beneficiaries of the arrangement.

Administration

3.29. With more than 14 million contributors in each, both the General Scheme and ARRCO are very large schemes; ARRCO is possibly the largest private sector pension scheme in the world. AGIRC, with more than 1.5 million contributors, is also very large. Administration of such large schemes brings its own problems, especially when extensive past service rights are granted and rights on change of employment are preserved. One manifestation of the difficulties is the fact that in all of these schemes a lengthy delay often occurs between the date a person retires and the date on which he first receives a pension payment. Delays are commonly six months and sometimes more than a year.

3.30. Computerization of the administration of the General Scheme and of ARRCO is in progress but by no means comprehensive as yet. The General Scheme is attempting the more ambitious programme because it is arranging to keep full records of both financial and employment details. The Scheme has a large computer centre at Tours (230 km from Paris) which is progressively improving its data base and its capacity to produce statistics. A separate organization (ACOSS) collects all social security contributions, including contributions for the General Scheme.

3.31. ARRCO is more advanced with its computer system, which is less ambitious in that its purpose is to coordinate employment details for all contributors so that on retirement their career history can be identified and verified quickly.

3.32. Computerization and rationalization of the administration of both the General Scheme and ARRCO are in progress, and it seems reasonable to expect that all the major administrative difficulties and inefficiencies will be resolved in the foreseeable future.
4. MANAGING AN ASSESSMENT SCHEME

4.1. A policy of the French Government has been to make the social security system self-supporting, by having contribution rates adjusted as necessary to support the payment of benefits at the promised levels. This has not always been achieved, for in recent years the Government has been required to make some contribution to enable all benefits to be paid. The General Scheme and the other basic schemes do not, therefore, operate strictly on an assessment basis as this is understood at ARRCO and AGIRC. These two groups have no external source of finance or guarantee, so that their survival is vested in their own ability to ensure that survival.

4.2. As the General Scheme no longer operates on a pure assessment basis, management of the scheme requires actuarial examination principally to review contribution rates and to determine the amount of any required subsidy. The situation is different for ARRCO and AGIRC. From the actuarial viewpoint, ARRCO itself, whose size is remarkable, is probably the most interesting example of a self-supporting assessment scheme.

The management of ARRCO

4.3. The principle of management of ARRCO is the following. Each year a reference return is set and, in relation to its ARRCO component, each member institution is obliged to maintain a return which does not differ from the reference return by more than 10%. (Member institutions of ARRCO are free to collect contributions and pay benefits at levels exceeding those required by the ARRCO agreement. See also § 3.10.) The principal task of ARRCO in this context is to select a suitable reference return. This return, in conjunction with compensation arrangements, must enable all member institutions to meet their benefit commitments for the year in accordance with the policy on pension increases being pursued by ARRCO. This policy will be constrained in principle by the necessity to maintain the long-term viability of the system.

4.4. The current ARRCO policy is to keep the reference return constant as far as this is possible, implying for the schemes operating by points an annual increase in pensions equal to the increase in the reference salary. Reference salaries are intended to be proportional to mean salaries. The basic strategy followed by ARRCO is to determine quinquennially a policy for the reference return for the next quinquennium, with the aid of projections prepared for the next fifteen years.

4.5. In 1969 it was recognized that the then reference return of 15½%, already down from the 1967 level of 16%, could not be maintained. Among other things the improving statistical knowledge of the ARRCO organization was beginning to show that the proportion of persons not claiming benefits to which they were entitled had been significant but was declining; by 1975 the proportion was negligible. Two steps were taken by ARRCO. The first was the straightforward one of progressively reducing the return to 15%, which level it reached in 1974.
The second was the ingenious idea of maintaining at 4% the contractual rate of contribution, but progressively increasing the 'called' rate of contribution from 100% to 110% of the contractual rate, or 4.4% of earnings. (The returns quoted above are apparent reference returns; the net effective reference return can be calculated after correcting for expenses, for differences between the applicable dates of the reference salary and the point value, and for the contractual versus the called rates of contribution. The apparent 1975 reference return of 15% represents a net effective return of 12.43%.)

4.6. Because points acquired are calculated according to contractual contributions, introduction of this called rate of contribution has some interesting implications. First, an individual, in receiving no additional points for his additional contributions, finds that the relationship between points acquired and salary is preserved. The move thus appears as a precedent for benefits remaining genuinely proportional to revalued total career salary, irrespective of small fluctuations in the contribution rate. Furthermore, it will make possible in the long-term maintenance of a higher return than if the higher contributions had acquired more points. The significance of this is two-fold; the relativity of pensions to salaries for different cohorts is preserved, and the higher return means higher pension increases. In effect the price being paid for higher increases is a reduction in the initial level of pension relative to contribution levels.

4.7. Resort to the device of 'called' contributions is a demonstration of the flexibility available in an assessment scheme operated by points. At the same time, this flexibility cannot easily be abused because ARRCO itself and every member institution is governed by its own council, usually numbering eighteen or twenty, with equal representation by both employees and employers. This council must approve any changes to be made and ministerial ratification is required before amendments can be introduced.

4.8. The fifteen-year projections made by ARRCO take account of all relevant demographic factors, including proportions of eligible spouses and possible changes in the composition of the work force, as well as examination of such financial aspects as salary scales, total points acquired and being acquired, the effects of and requirements for reserves.

4.9. In setting in advance a certain return based on actuarial projections, surpluses may arise some years and deficits other years. The reserves held are designed to keep the system solvent on a day-to-day basis (this is significant at ARRCO because contributions are usually received quarterly in arrears and pensions paid quarterly in advance), to meet the cost of adverse short-term demographic conditions or to otherwise assist in the medium-term management of the reference return. The reserves, therefore, act as a buffer to stabilize the scheme's operations. In 1975 the total of the ARRCO reserves, designated 'solidarity reserves' with small additional contingency reserves, was of the order of 80% of one year's contributions. Because the scheme is so large these reserves amounted to more than 9,000 million francs (about £1,100 million) at
31 December 1975. The reserves are held by the member institutions of ARRCO, mainly in the form of readily realizable investments.

4.10. Compensation amongst the ARRCO institutions is carried out annually on the principle that transfers between institutions should enable each one to maintain the reference return and at the same time to bear the same pensions burden relative to contributions received by it. A redistribution of reserves also takes place in proportion to contributions received. This is achieved for each institution by calculating, on the one hand, corrected benefits, being the amount of pension payments calculated on the reference return, and on the other hand, levelled benefits, being the same proportion of contributions for each scheme. The total of levelled benefits for all institutions equals the total of corrected benefits. An individual amount equal to corrected benefits less levelled benefits is then transferred into or out of each institution, as the case may be, so that after compensation each institution has a benefit liability equal to the amount of levelled benefits. The resulting excess (or shortfall, to 1975 always an excess) of contributions over benefits is allocated to (or taken from) reserves.

4.11. This method of compensation not only levels the effective liability of the different institutions but, because it is based on the reference return rather than the actual return, it becomes costly for any scheme to offer a higher return and the method would lead to a surplus in any scheme offering a lower return. It thus appears as a feedback control mechanism tending always to stabilize at the reference return. It also reinforces the concept of tying benefits to earnings and maintains across all the schemes the same concept of equity that is implicit in the design of each individual scheme.

5. POTENTIAL AND LIMITATIONS OF FRENCH-STYLE ASSESSMENT

5.1. As contributions paid to an assessment scheme are immediately available for the payment of benefits, assessment schemes can offer beneficiaries three very important advantages over funded schemes:

(a) regular and automatic adjustment of pensions in course of payment, adjustments being related to salary movements;

(b) the opportunity when granting membership or modifying benefits to give immediate recognition of periods of past service to existing contributors and pensioners; and

(c) inflation-proofed preservation, on transfer or cessation of employment, of accrued rights which are secured to the same extent as all other pension rights.

Pension increases

5.2. The capacity to revise pensions regularly, discussed in §§ 2.7, 2.9 and 2.21, follows from the fact that contributions rise in proportion to salaries, making available more money for the payment of pensions.
Past service

5.3. When an assessment scheme is introduced, if contribution rates are based on the scheme being mature, as is usually the case, it is possible to pay benefits to former employees who could not contribute to a scheme which did not exist, and also to recognize the past service of employees who become contributors when the scheme commences. These possibilities have been utilized as a matter of standard procedure in France. They are normally put into practice by reconstituting in some suitable way the past career of each person entitled to recognition of past service.

5.4. In extending the coverage of existing schemes, past service rights are usually accorded to persons not previously members of the scheme. In this case, full recognition of past service is not always given, in order to maintain some appearance of equity between new entrants obtaining free past service entitlements and members who were previously contributing. The degree of recognition of past service may be quite arbitrary, or it may for example be a function of the average periods of past service of existing members.

5.5. The possibility of amending assessment schemes by increasing contributions or running down reserves in order to benefit immediately all existing pensioners can be seen as open to abuse which could threaten the maintenance of solidarity between generations. In France the main counter to this danger, which is limited in any case by the extent to which contributions can be increased and the small reserves utilized, is the administrative and legal structure referred to in § 4.7. Solidarity does not so far appear to have been threatened in any way by irresponsible management.

Preservation of rights

5.6. In funded schemes the problem of satisfactorily preserving pension rights on change of employment continues to appear intractable, due mainly to uncertainty as to who should or who can bear the inflation risk between the time of change of employment and attainment of retiring age. Since inflation is not a risk in assessment schemes, the problem is capable of simple solution. The effectiveness of the solution is vested in the long-term maintenance of both inter-occupational and inter-generational solidarity.

5.7. In France the mechanism for preserving rights is based on the concept of deferred pensions rather than of transfer values; clearly any transfer value calculated as a present value of accrued rights would be inappropriate in an assessment scheme. The payment of a pension deferred for many years is no particular burden where a system of compensation between schemes operates. It is conceivable for rights to be transferred at the time of transfer of employment, the compensation system being relied upon to achieve equilibrium later as necessary. In practice the system of deferred pensions has been preferred in France because it avoids the need to express rights under the rules of one scheme as rights under the rules of another scheme which may be different. It also allows adequately for persons who cease employment, or who have been
members of two different schemes which are not part of a joint compensation arrangement.

The price of assessment

5.8. The advantages of assessment do not of course arise without some sacrifice. In return for the advantages, there is first a presupposition that all or almost all benefits will be payable in the form of pensions. (It would undoubtedly be possible to construct a model for an assessment scheme offering some kind of lump sum benefits, but such a possibility is outside the conceptual framework of French pension systems and is not considered here.) Secondly, there are four fundamental conditions which must be safeguarded to ensure the successful long-term operation of the system. These conditions, which relate to the ability and willingness of each generation of income earners to meet the emerging costs of benefits to the inactive population, can be described as follows:

(a) Membership must be made compulsory for all income earners eligible for membership of the scheme, with a correspondence being maintained between the group of contributors and the group of persons entitled to benefits.
(b) The contributors must represent a group of income earners for whom continuity of income is assured and whose numbers can be relied upon to be continually replenished by recruitment.
(c) Either benefits or contributions or both must be adjustable to enable the scheme to meet its commitments from the resources provided by contributions.
(d) Suitable administrative machinery must be instituted to collect contributions and to recognize and honour benefit entitlements.

5.9. All of these conditions are axiomatic, but they must be given clear expression in the establishment of an assessment scheme. The first condition is nowadays a normal condition in funded occupational schemes. The second condition is familiar and, outside France, arguments against the introduction of assessment are frequently directed at demonstrating the impossibility of satisfying this condition. The third condition is also familiar, for in practice a degree of freedom must be available in any scheme, funded or unfunded, to cater for departures of actual future events from expected future events.

5.10. It has long been recognized that the conditions of solidarity can be met in a basic national scheme. The intriguing question regarding the French system is how, outside the basic national schemes, the conditions of solidarity have been satisfactorily met up to the present, if indeed they have, and whether they can continue to be met in the future.

5.11. The fact that AGIRC has now existed successfully for almost thirty years and ARRCO for nearly fifteen years demonstrates that some kind of solidarity has been achieved. In the case of AGIRC, with a membership which although large is restricted to a particular class of employee, its survival has been facilitated by a favourable contributor/pensioner ratio, for the number of
contributors has consistently grown more quickly than the number of pensioners. This situation could not have endured, and in fact by 1975 it no longer obtained. AGIRC could conceivably have entered into compensation arrangements with ARRCO; it has not done so, and hence it appears that its survival is dependent on the continuation of the numerical strength of the body of employees known as cadres.

5.12. It is interesting to note that at least part of the strong growth of AGIRC and of the number of cadres has been attributed by some to the generosity of the pensions provided by AGIRC. The additional persons who have sought and obtained cadre status over the years have only made more favourable the short-term demographic situation.

5.13. As explained earlier, ARRCO was created to meet the need for orderly development of numerous pension schemes already in existence. In other words, ARRCO was the outcome of a pertinent recognition of the need for solidarity across occupational and employer groups. This solidarity has been achieved by the introduction of a suitable form of compensation and has facilitated extension of the solidarity across virtually the whole salaried population of the private sector, with the exception of agricultural employees and of cadres in respect of their earnings above the Social Security ceiling. It is understood that arrangements are in progress for agricultural employees to join the ARRCO group.

5.14. The demographic basis of the schemes or institutions associated with ARRCO can therefore be regarded as so broad now that their joint viability should be threatened only by factors which threaten the economic life of the nation as a whole.

Assessment and a changing economy

5.15. Demographic projections can be made with some confidence, especially as the least certain factor, the birth rate, has no effect on the working age population for two decades and any gross effects of migration can be controlled by government policy. Far less predictable are rates of salary and price inflation, unemployment and levels of productivity. Other factors which can affect the financing of pensions by assessment include changes in the retiring age, reductions in working hours, changes in the relative structure or in the nature of remuneration, and nationalization of industry. Can assessment accommodate these changes?

5.16. The following comments are intended to describe in a general way the connexions between some economic variables and the performance of assessment schemes. The impact of assessment schemes on the economy, including the question of pension fund investment, is considered in Section 6.

5.17. In contrast to funded schemes, the existence of price inflation does not have any direct effect on an assessment scheme.

5.18. A constant rate of salary inflation is not in itself of any concern in the operation of an assessment scheme. Acceleration and deceleration of changing
salary levels do, however, cause short-term distortions; there is necessarily a delay between increases in contributions, which occur spontaneously with salary increases, and increases in pensions, which are awarded only after salary increases have been measured. These distortions are second-order effects of inflation, and are of small significance by comparison with the first-order effects felt by funded schemes. Furthermore, the effects can be mitigated by anticipating short-term changes in salary levels.

5.19. There are several ways of dealing with unemployment in relation to pension scheme entitlements, whether the system be funding or assessment. If there is a comprehensive unemployment insurance scheme operating, this scheme may maintain pension scheme contributions, in which case unemployment has no direct influence on the pension scheme, at least in the short term. If, on the other hand, contributions are not made in respect of periods of unemployment, a funded scheme would not normally offer any benefits and would therefore be unaffected. In an assessment scheme, however, it is possible to grant benefit rights without the payment of contributions.

5.20. The short-term effect of significant unemployment on an assessment scheme is a reduction in contribution income. This reduction can be met either by utilizing contingency reserves or, in the longer term, reducing the scheme’s return. If benefits are reduced rather than contribution rates increased, the retired population would effectively be sharing with the working age population the dislocation caused by unemployment. The granting of pension rights in respect of periods of unemployment has no short-term effect, but when the persons granted such rights reach retiring age, the pensions of all relative to contributions will be lower in proportion to the rights granted during unemployment.

5.21. In so far as the level of productivity influences the level of salaries and employment, productivity is vital in providing the means to pay pensions, for it supplies the resources necessary to sustain both the working population and the retired population. In a growth economy, it may be possible to improve working conditions (e.g. remuneration, working hours) and at the same time maintain or even improve the real value of pensions. If productivity is falling, however, maintenance of the real value of pension benefits implies distribution of an increasing share of resources to the retired population. Whether or not this occurs may well be a political question, and will probably be related to the expectations of pensioners and to the extent of guarantees or promises given to them. From the technical point of view, however, assessment schemes are well placed to deal with falling productivity for, as with high levels of unemployment, the return can be reduced. Hence any reduction in total purchasing power can in principle be shared between the active and the retired populations.

5.22. In general, it can be said that assessment schemes, if not burdened with a commitment to pension increases equal to salary increases, have a structure which is sufficiently flexible to enable them, political and social conditions permitting, to adapt to either adverse or favourable changes in demographic
An Alternative to Funding?

and economic conditions. It is true that they will not necessarily maintain the same benefit levels under adverse conditions. This is of course also true for funded schemes although the effects of changing conditions will be felt more quickly in assessment schemes.

5.23. The flexibility of assessment schemes and the three major advantages, described in § 5.1, that they have over funded schemes have either led to or been preceded by the following underlying attitudes which are nowadays an integral part of social security thinking in France:

(a) It would be totally unacceptable to offer pensions which cannot be revalued regularly to maintain at least approximate parity with salaries.

(b) It would be totally unacceptable to deprive employed persons of inflation-proofed accrued pension scheme rights on cessation or change of employment.

(c) It is natural to relate benefits beyond a basic minimum to both length of service and to earnings—this applies at the level of the basic national schemes as well as the complementary schemes. The notion of equity as between individual contributors is therefore consistent with that usually held in private sector funded schemes.

(d) A standardized range of benefits, and uniform minimum levels of contributions and benefits, are acceptable across differing employee and employer groups in a variety of industries.

(e) Inter-generational transfer of pension scheme contributions is quite acceptable. Indeed it could be said that the French regard the guarantee implicit in their solidarity arrangements as a better guarantee than can be provided by means of an invested fund.

5.24. The achievements of pension schemes in France in relation to (a) and (b) above are enviable. By contrast, in countries where funded schemes operate, satisfactory financing of pension increases and preservation are unfortunately no more than ideals as yet unattained. The price paid in France is of course (d) and (e) above, the acceptance of fairly uniform pension scheme conditions and of inter-generational transfers.

5.25. One may be tempted to think that there is some ideological barrier between assessment and funding, on one side of which is the socialist approach to redistribution of wealth and on the other the liberal approach identified in this context by a savings ethos. It would be wrong, however, to assert either that ideological considerations played a part in the introduction of assessment in France, or that they have been responsible in any way for its continuation. Indeed the continuing development of assessment schemes in France is a history of expediency and empiricism, and has certainly not been without its difficulties. Recognizing that any contraction of contribution income can lead to failure, assessment was initially looked at askance by the French actuaries but now it is not just accepted but advocated by them. Anyone wishing to introduce an assessment scheme would therefore be bold indeed to ignore the French experience.
Conclusion

5.26. The preceding paragraphs have attempted to explain the potential of assessment schemes in France for adapting to changing circumstances. This potential arises from the innate flexibility of the system and is limited, save for exceptional political interference or irresponsible management, only by the ability of the economy at large to survive as a viable entity.

5.27. This flexibility does not of itself constitute an argument for the replacement of funded schemes by assessment schemes. It does, however, indicate that if assessment schemes are introduced not only is there no need for pessimism as to their viability, there are positive social advantages to be derived from them.

6. ASSESSMENT AND ITS IMPLICATIONS

6.1. Assessment schemes have long been regarded as acceptable for national basic pension schemes, but have never been seriously advocated a priori for the private sector. This was as true in France as anywhere else until well after assessment schemes were introduced there. It is notable that although the AGIRC scheme came into existence in 1947, the first paper on assessment to be published in the quarterly bulletin of the Institute of French Actuaries did not appear until 1956.*

6.2. This first paper on assessment drew some comparisons between funded schemes and assessment schemes. The author, Monsieur P. Dubois, showed among other things that in a stable population the benefits available from an assessment scheme are equal to benefits available in a mature funded scheme if the rate of interest is equal to the rate of inflation. More generally, if the population (active and retired) of the assessment scheme is stable and growing at any given annual rate, benefits will be equivalent to those in a mature funded scheme where the rate of interest exceeds the rate of salary inflation by this annual growth rate. These conclusions, which can be reached by general reasoning, struck a stronger chord in 1976 than in 1956 because now we are accustomed to seeing the difference between the rate of interest and the rate of salary inflation negative as often as it is positive (see Appendix A). Twenty years ago such a possibility was not seriously entertained, except perhaps in France.

6.3. France today is effectively condemned to assessment, for better or for worse, and the nation's actuaries and other interested persons have responded by doing all in their power to make assessment work. We are not in this position, but we have been witnessing in recent years a progressively reducing effectiveness of funded schemes, despite our efforts to make them work. It is none too early, therefore, to make a critical examination of funding in order to ascertain how well it will bear up to the demands to be made of it in the future.

6.4. The apparent precariousness of depending on even a demographic ratio for any pension scheme other than a basic national scheme has always been the

subject of considerable caution by Anglo-Saxon actuaries. Yet the uncertainties
of future economic conditions, including the need to distinguish between
structural changes and cyclical fluctuations in modern economies—in particular,
can we ever expect a return to 'normal' investment conditions where real rates
of return are positive?—appear, at least superficially, to render assessment
schemes superior to funded schemes in guaranteeing suitable benefit levels in
both the short term and the long term. The aim of the following paragraphs is to
broach the delicate subject of identifying the precepts of funding and of our atti-
tudes towards funding, in the hope that they will receive critical re-examination.

The rationale of funding

6.5. Originally the case for funding pension scheme benefits was very power-
ful, because:

(a) the accumulation of invested assets securing the promised benefits was seen
to be the only satisfactory form of guarantee that the contract would be
fulfilled;
(b) regular saving and investment was a rational form of behaviour because
not only did it provide financial security but it reduced costs due to the
receipt of investment income which more than compensated for the effects
of inflation on the levels of benefits; and
(c) prudent business practice required that the costs of pension benefits be met
progressively during the careers of the persons who were accruing pension
entitlements.

6.6. The desire to fund in advance was strengthened by a society which placed
moral value on thrift; it was virtuous to save for one's own future. The appeal of
funding has been extended further by a commonly-held belief that the invest-
ments made with savings from pension scheme contributions form an essential
component of the community's total investments.

6.7. These arguments for funding do not now have the same force as formerly,
because:

(a) although funding is essential for life assurance and other voluntary contracts,
the French and other experience with universal compulsory pension schemes
demonstrates that the security provided by a fund is not essential for the
viability of these schemes;
(b) some doubt now exists as to the long-term validity of the assumption that
available rates of interest will always equal or exceed the rates at which
salaries increase; and
(c) if the society as a whole accepts the concept of today's workforce supporting
today's pensioners, there is no purpose in a business enterprise accumulating
funds against the future liabilities for pension benefits of its employees.

The investment question

6.8. Each of the statements in the preceding paragraph relates directly to the
rationale for funding. Unrelated to this rationale but nevertheless an outcome of the practice of funding is the regular supply of savings available for investment.

6.9. In countries where funded pension schemes exist, the funds of these schemes may represent a substantial proportion of total investment capital. Supporters of funded schemes have often argued that if these funds ceased to be available, the consequent fall in real savings would be so substantial as to permanently impair the capacity of the economy to maintain productivity, sacrificing this in the case of assessment schemes for the sake of immediate consumption. This argument relies on the belief that funded pension schemes are a necessary source of savings, and that maintenance of a particular level of capital formation, made possible by savings, is necessary to economic growth. Are these beliefs well founded?

6.10. The total level of savings in the community is determined by many factors. In addition to the net income of pension funds (i.e. contribution and investment income less benefit payments) other factors affecting the level of investment include the consumption and savings patterns of employed and retired individuals, the investment behaviour of both the private and public sectors, and Government fiscal policies such as the magnitude of budget surpluses or deficits and taxation policies.

6.11. Even if it were demonstrable that the abandonment of funding would lead to a reduced level of savings, it does not follow that the consequent reduction in capital formation would have any adverse effect on economic growth. This question is confronted by the Australian National Superannuation Committee of Enquiry which points out that 'The economic significance of capital formation is the subject of some controversy and the traditional assumption that additions to the stock of physical capital are the major sources of economic growth has come under strong challenge'. This Committee concluded that 'it is reasonable to be sceptical about arguments which simply take for granted the necessity of promoting saving'.

6.12. It is interesting to note in passing that the rate of capital formation in the French economy, as indicated by the figures in the following table, has been high in recent years by comparison with the United Kingdom and other countries. This fact seems to cast doubt on any assertion that pension fund net savings are essential to the existence of a satisfactory level of capital formation.

Gross fixed capital formation as percentage of gross domestic product

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<tr>
<td>France</td>
<td>24·3</td>
<td>24·3</td>
<td>25·1</td>
</tr>
<tr>
<td>U.K.</td>
<td>18·6</td>
<td>19·5</td>
<td>20·0</td>
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<tr>
<td>Australia</td>
<td>26·2</td>
<td>23·7</td>
<td>23·6</td>
</tr>
<tr>
<td>U.S.A.</td>
<td>18·1</td>
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6.13. The net effects of the different factors influencing the degrees of capital formation and economic growth are not therefore obvious, so that the likely effects of ceasing to fund pension benefits would require careful investigation.

6.14. Noting that:

(a) in the context of the rationale for funding, the funding of pension schemes gives rise to savings only as a by-product; and
(b) adequate total levels of investment can be achieved in an economy which has no pension funds,

it is suggested that the investment question is one which is of only subsidiary importance in any appraisal of funding.

The funding creed

6.15. Funded pension schemes in the private sector are today so heavily entrenched in many countries that any advocate of a change to assessment risks being regarded as irresponsible. It is perhaps significant in this respect that the British Government's 1974 White Paper *Better Penstons* was developed in the firm belief that not only should private sector funded schemes continue to exist, but that the unfunded State supplementary pension scheme should be such that funded occupational schemes would be sufficiently competitive with it to ensure a significant degree of contracting out.

6.16. It becomes clear, therefore, that replacement in the private sector of funded pension schemes by assessment schemes could not begin to be considered before either:

(a) there was a sizeable and responsible group believing that such a change should take place, and being prepared to actively advocate the change; or
(b) the system of private funded pension schemes became manifestly unsatisfactory or unworkable.

6.17. The optimist points to a century of survival of funded pension schemes, a century characterized by sound financial management and endurance through bad times. He usually also alludes to a fundamental belief that our whole market economy can survive only if in the long term investors receive a positive real return on their investments. Funded pension schemes will therefore last as long as the economy itself.

6.18. The pessimist on the other hand points to several years of salary increases exceeding rates of investment return, and has no confidence in the proposition that this situation will reverse in the long term. He recognizes that pressure for better guarantees for pension increases and preservation of rights are being answered not by acceptance of the heavy burden of full funding, but instead by a progressive dilution of the funding procedure. He is therefore sceptical or even openly critical of funding.

6.19. Who is the realist? In France it no longer matters, because the point of no return has been passed. Most French actuaries are today critical of funded
pension schemes, a view which they can afford to hold with impunity since for them the question is of academic interest only. Their position nowadays is as conservative in France as is the generally optimistic position of most actuaries elsewhere, who, in their own countries, advocate funding.

6.20. If the pessimist is the more realistic, either the solvency of pension schemes which are today called funded will progressively deteriorate, or the viability of the enterprise funding the scheme will be endangered.

6.21. If the optimist is shown by future history to have been the realist, how good is his present justification for his position? More specifically, given that the actuarial profession has relied for its reputation largely on its ability to give sound and responsible advice on long-term financial matters, and in doing so has often in the past been criticized for making very safe or pessimistic assumptions as a matter of prudence, how does it justify its present optimistic view that pension schemes can be properly funded and at the same time guarantee benefits related to future salary levels?

6.22. The detrimental effects of inflation on investments are year by year generating a potential crisis for funded pension schemes. At the same time, there are many actuaries and others who believe that the continuation of a system of funded pension schemes is imperative. Equally there are many people who have or believe they have a vested interest in continuation of this system. It is to be hoped that notwithstanding these beliefs and interests the system can be objectively and critically examined. Funded pension schemes are not performing as we had hoped: can we afford any longer the optimistic platitude that our problems are only temporary, that soon enough and from then on over the long term investment returns will exceed rates of salary increase?

6.23. If pension benefits are to be adequate, there are two alternatives: to bring about a structural change in our investment institutions so that a positive real return can be assured, or else to abandon funding. To proceed responsibly, we need to understand both fully, and to consider the full consequences of our conclusions, even if they may seem unwelcome.

7. ACKNOWLEDGMENTS

7.1. I wish to record my gratitude to the many people in Paris who in the latter part of 1975 so willingly gave of their time, with great linguistic patience, to further my understanding of French pension arrangements. In particular I am indebted to M. Francis Netter (formerly actuary in the French Ministry of Labour and one of the architects of répartition in the 1940s), Messrs Jacques Amzallag and Jacques Léon (actuaries at ARRCO) and M. Jean-François Chadelat (actuary in the Ministry of Labour) for their valuable and authoritative assistance.

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### Rates of Interest and Inflation

**A.1.** The table below is derived from *OECD Main Economic Indicators, 1955–1971* and *OECD Main Economic Indicators, May 1976*.

<table>
<thead>
<tr>
<th>Country</th>
<th>Period</th>
<th>Consumer prices (1)</th>
<th>Earnings (2)</th>
<th>Government bonds (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>1955–60</td>
<td>5·8</td>
<td>8·3</td>
<td>5·5</td>
</tr>
<tr>
<td></td>
<td>1960–65</td>
<td>3·8</td>
<td>7·5</td>
<td>5·0</td>
</tr>
<tr>
<td></td>
<td>1965–70</td>
<td>4·4</td>
<td>9·2</td>
<td>6·0</td>
</tr>
<tr>
<td></td>
<td>1970–75</td>
<td>8·8</td>
<td>14·7</td>
<td>9·0</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1955–60</td>
<td>2·6</td>
<td>4·7</td>
<td>5·1</td>
</tr>
<tr>
<td></td>
<td>1960–65</td>
<td>3·6</td>
<td>4·5</td>
<td>6·1</td>
</tr>
<tr>
<td></td>
<td>1965–70</td>
<td>4·6</td>
<td>6·8</td>
<td>7·7</td>
</tr>
<tr>
<td></td>
<td>1970–75</td>
<td>12·8</td>
<td>17·1</td>
<td>12·0</td>
</tr>
<tr>
<td>Australia</td>
<td>1955–60</td>
<td>3·1</td>
<td>3·6</td>
<td>5·0</td>
</tr>
<tr>
<td></td>
<td>1960–65</td>
<td>1·8</td>
<td>2·6</td>
<td>5·0</td>
</tr>
<tr>
<td></td>
<td>1965–70</td>
<td>3·1</td>
<td>5·3</td>
<td>5·6</td>
</tr>
<tr>
<td></td>
<td>1970–75</td>
<td>10·2</td>
<td>15·9</td>
<td>7·8</td>
</tr>
<tr>
<td>U.S.A.</td>
<td>1955–60</td>
<td>2·0</td>
<td>3·9</td>
<td>3·7</td>
</tr>
<tr>
<td></td>
<td>1960–65</td>
<td>1·3</td>
<td>2·9</td>
<td>4·1</td>
</tr>
<tr>
<td></td>
<td>1965–70</td>
<td>4·2</td>
<td>5·3</td>
<td>5·6</td>
</tr>
<tr>
<td></td>
<td>1970–75</td>
<td>6·8</td>
<td>7·4</td>
<td>6·2</td>
</tr>
</tbody>
</table>

*Notes:* Column (1) is average annual increase in the consumer prices for all goods and services. Column (2) is average annual increase in hourly earnings in manufacturing. Column (3) is average rate of interest for last issue of Government bonds in each calendar year.

**A.2.** The table clearly shows that earnings during the last twenty years have consistently increased more quickly than prices. It is probably reasonable to assume that this situation will continue in the future.

**A.3.** It is not known how representative of community wage levels as a whole are the hourly earnings in manufacturing industry. Assuming, however, that they are representative, and that invested pension funds would generally earn higher yields than are available on government bonds, the figures in the table suggest that sound investment management would have allowed pension funds in the United Kingdom, Australia and U.S.A. to match salary increases, at least until 1970. Since 1970, only in the U.S.A. could investment returns be expected to have matched salary increases.
APPENDIX B
ASSESSMENT—FURTHER THEORY

The equation of equilibrium

B.1. The fundamental equation of equilibrium for assessment schemes is equation (1) as set out in § 2.1. This equation can be stated more generally as:

\[ \int_0^T C(t) \, dt = \int_0^T D(t) \, dt \]  (B1)

where \( C(t) \) are the contribution receipts at time \( t \), \( D(t) \) are the total disbursements (including expenses) at time \( t \), and \( T \) is the total period over which equilibrium is to be maintained.

B.2. In the simplest case, \( T \) would be one year. Much of the development of assessment theory, however, has related to the extension of \( T \) to periods of ten or more years, together with consideration of the reserves desired or required to be held at time \( T \).

B.3. The level of reserves will normally be expressed as a proportion of one year’s contributions, for the absolute level of the reserves has little relevance. The required level of reserves at the end of the period will be specified as a matter of policy based on cash flow requirements, allowance for contingencies, etc. If \( R(t) \) is the level of reserves at time \( t \) (expressed as a proportion of say \( \int_{t-1}^t C(t) \, dt \)) and \( i(t) \) is the average rate of interest being earned on these reserves, equation (B1) becomes:

\[ R(0) + \int_0^T C(t) \, dt + \int_0^T i(t)R(t) \, dt = R(T) + \int_0^T D(t) \, dt \]  (B2)

B.4. In solving equation (B2), one constraint to be observed is that there must be a non-negative working balance at all instants \( t \) between 0 and \( T \), i.e.

\[ R(0) + \int_0^t C(t) \, dt + \int_0^t i(t)R(t) \, dt \geq \int_0^t D(t) \, dt \]

Assessment without points

B.5. The most common kind of assessment scheme without points in France is a benefit promise scheme wherein the pension granted is a specified proportion of the defined pensionable salary per year of service, as in many funded schemes. In a scheme of this kind the rate of pension increase will need to be determined differently from the rate used in a points scheme, and a comparable return will also be calculated differently.

B.6. To calculate pension increases, a uniform rate of increase would normally be applied to all pensions in force, even if past rates of increase have changed the relative ‘real’ value of pensions granted at different times. The rate of increase in a given year would be determined in advance by solving an equation of the following kind:

\[
\begin{align*}
\text{(Expected net contribution receipts)} \\
= & \ (\text{Expected payments for new pensions granted}) \\
+ & \ (1 + j) \ (\text{expected payments of pensions already in force}) \\
+ & \ (\text{net increase in reserves to be held})
\end{align*}
\]
Solving this equation for $j$ will give the rate at which pensions already in force are to be adjusted.

B.7. A crude return $r_c$ can be defined for a scheme of this kind as:

$$ r_c = \frac{f}{c} $$

where $f =$ initial pension per year of service, expressed as a percentage of pensionable salary, and $c =$ total contribution rate, expressed as a percentage of earnings.

This return $r_c$ is not commensurate with the return in a points scheme.

B.8. A scheme operating by points can be characterized by its return, which represents the annual amount of pension payable per unit of revalued salary, i.e. the annual amount of salary in 'real' terms. This return is the same for all pensioners.

B.9. If a final salary/length of service scheme granting a uniform rate of pension increase each year is to be compared with a points scheme (and this is necessary if there is a system of compensation among schemes of the two types), the crude return $r_c$ must be adjusted to take account of:

(a) the relationship between average pensionable salary $S_p$ and the average salary $S_a$ on which contributions are levied—a single ratio $S_p/S_a$ may be determined from salary scale and age distribution considerations; and

(b) changes in relative levels of pensions arising from any differences between past rates of pension increase and past rates of salary increase—these changes may be different for every retired cohort.

B.10. Incorporating these adjustments into the calculation of the return in a final salary/length of service scheme, a return which is commensurate with the return $p/s$ in a points scheme will be of the following form:

$$ r = \frac{f}{c} \times \left\{ \frac{\text{average ratio of pensionable salary to career average salary}}{\text{weighted average value of pensions in force relative to current salary levels}} \right\} $$

$$ = \frac{f}{c} \times \frac{S_p}{S_a} \times \frac{\sum_{m=0}^{w} P_m I(m)}{\sum_{m=0}^{w} P_m} $$

where $P_m =$ total pensions in force for $m$ years

$$ I(m) = \prod_{t=1}^{m} \frac{1+i(m-t)}{1+j(m-t)} $$

$i(t) =$ rate of pension increase in year $t$

$j(t) =$ average rate of salary increase in year $t$. 


APPENDIX C

SOCIAL SECURITY INCOME AND EXPENDITURE IN FRANCE

Estimates of income and expenditure for 1976 (millions of francs)

<table>
<thead>
<tr>
<th>Income:</th>
<th>General Scheme</th>
<th>Agricultural employees</th>
<th>Special schemes</th>
<th>Self-employed</th>
<th>Complementary schemes</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contributions</td>
<td>167,900</td>
<td>5,100</td>
<td>19,300</td>
<td>7,700</td>
<td>29,000</td>
<td>7,800</td>
<td>236,800</td>
</tr>
<tr>
<td>Transfers</td>
<td>200</td>
<td>5,700</td>
<td>3,300</td>
<td>1,800</td>
<td></td>
<td>1,200</td>
<td>12,200</td>
</tr>
<tr>
<td>Other</td>
<td>8,300</td>
<td>10,800</td>
<td>10,900</td>
<td>2,800</td>
<td>700</td>
<td>800</td>
<td>34,300</td>
</tr>
<tr>
<td>Total</td>
<td>176,400</td>
<td>21,600</td>
<td>33,500</td>
<td>12,300</td>
<td>29,700</td>
<td>9,800</td>
<td>283,300</td>
</tr>
</tbody>
</table>

| Expenditure:     |                |                        |                 |               |                        |       |       |
| Pensions (age    |                |                        |                 |               |                        |       |       |
| and invalidity) | 42,700         | 11,000                 | 23,100          | 8,000         | 26,100                 | 1,900 | 112,800 |
| Sickness         | 68,600         | 5,500                  | 6,100           | 3,800         |                        | 7,000 | 91,000 |
| Accident         | 11,400         |                        | 2,000           |              |                        |       | 13,400 |
| Family Benefits  | 39,200         | 2,700                  |                |              |                        |       | 41,900 |
| Expenses         | 12,000         | 2,000                  | 700             | 700           | 1,900                  | 700   | 18,000 |
| Transfers        | 11,500         | 400                    | 200             | 100           |                        | 12,200 |
| Other            | 1,100          |                        | 200             | 100           |                        | 200   | 1,600  |
| Total            | 186,500        | 21,600                 | 32,300          | 12,700        | 28,000                 | 9,800 | 290,900 |

| Surplus          | -10,100        |                        | 1,200           | -400          | 1,700                  |       | -7,600 |

Source: Pour renflouer la Sécurité Sociale (French Government publication, 1976).

The above figures can be compared with an estimated gross domestic product for 1976 of the order of 1,600,000 million francs, and total remuneration of employees of the order of 800,000 million francs.
ABSTRACT OF THE DISCUSSION

The author: We live in an era of uncertainty; uncertainty because our economic machine is no longer functioning as smoothly as we think it ought, uncertainty which is causing our politicians to remind us daily of the maladies of an economic system gone awry. Our trade union leaders are bewildered in the face of high unemployment and some reduction in living standards. Our employers and managers are equally bewildered because inflation continues to make their lives very difficult, and they scratch their heads over whether the next investment will be worthwhile. In some quarters we hear that generous social welfare schemes are the root of our problems, in other quarters that the workers will not work, and in others again that the managers cannot manage.

But we cannot reject our existing institutions. We cannot overnight eliminate these criticisms nor change the basis of them. Of course our social welfare systems are generous, and of course our aspirations for occupational pensions are high. Our society has built up certain expectations and certain social values. These systems can be reduced in scale perhaps, but they can certainly not be abandoned; they must be perpetuated. Of course the workers must work; it is only by their being productive that the means of paying any social welfare benefits exist. That applies whether we fund our benefits—for investment income can only arise from workers making capital productive—or whether we pay benefits directly from current revenue. Of course managers must manage efficiently and invest skilfully. The community must invest in its own future. We cannot, for long, draw upon the wealth created by our predecessors without compromising the future.

It is appropriate in these times of high inflation to ask afresh where does a pension fund belong, where is its proper place? Where is the place of the pension scheme which operates without a fund? A traditionalist may say that the pension fund belongs in England and that the assessment scheme belongs in France. But it is not as simple as that; it is not just a matter of free choice.

It is probably a historical accident that we have funds and that the French do not. Be that as it may, however, the time has come in this era of economic uncertainty to examine closely whether to fund our pension schemes, or whether to take steps to abandon the traditions which have in the past served us so well, but which now are creaking at the seams, and giving rise to prospects which are no better in 1977 than they were in 1976.

We, as Anglo-Saxons, have never really believed that the French can do anything that we cannot do. I don't suggest for one moment that we need to change that belief—and I say this with the utmost respect for the French, but I do suggest that the forces of history have led the French to a system of pension arrangements which is far more flexible and resilient than our own in the trying times of economic uncertainty in which we find ourselves. In these circumstances, I appeal to you to re-examine our own methods and traditions in the light of a proper understanding of what the French are doing, why they are doing it, and what they believe they are achieving by it.

Mr M. D. Day: I would have welcomed rather more description, in particular of the historic background and development of assessmentism in France, so that I might understand more fully the economic and political reasons behind each decision that led to the present situation. On the other hand, I am not sure that the various formulae included in the paper really add much to it.

When reference is made to 'pay-as-you-go' or non-funding or assessmentism, it is assumed that we are considering a scheme or series of linked schemes covering the whole population or virtually the whole of it. We are not considering the possibility of assessmentism applied to just part of the working population; for example to one particular industry that may in time become a declining industry, or even a scheme applied just to the public sector.

Some countries are vehemently in favour of pension scheme funding whereas others are just as strongly in favour of assessmentism. Swiss and French actuaries have long argued this
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point; but as long as the economic climate in each country has been suitable for the particular kind of method adopted, the debate has largely been at the theoretical level. However, once the economic climate changes to the detriment of the chosen method, the debate must become less academic and more practical.

The recent experience in the United Kingdom of high inflation rates, and negative real rates of return on investments has been putting immense strains on funded pension schemes or, to be more precise, on those who have to finance the schemes. The time is ripe to consider whether our system of pension provision is still appropriate. Any U.K. actuary's valuation basis has probably assumed that, whatever the short-term outlook, in the long term an era of low inflation will return and also, and more importantly, an era in which yields on investments exceed the rate of earnings increase. Naturally, we all hope that our current economic difficulties are only temporary but no one has yet answered the question: "How long must our temporary economic difficulties continue before our long-term outlook changes?" There are always dangers in trying to compare the experience of one country with another but the table on page 201 suggests that in France yields on investments have not kept pace with the increase in earnings for at least 20 years. If this situation had obtained in the U.K. would we still be assuming that in the long term interest rates would exceed the rate of earnings increase?

Let us consider the arguments in favour of funding. One of the strongest is that of security: even if your employer goes out of business, there should still be sufficient assets in the fund to provide your pension. Under a universal assessment scheme your pension is still independent of the fortunes of your employer. It might be argued that, under 'pay-as-you-go', pensioners are dependent on the continuing goodwill of the working population to provide their pensions. Whatever system is adopted though it is the working population that supports the non-working population; if the working population were determined not to support the aged they could always find ways. For example, a future government might decide to remove the tax advantages currently granted to pension funds or might severely restrict the level of dividends payable to shareholders. A similar effect might be achieved by workers demanding—and obtaining—a greater share of company profits. Either way, the effect on the pension funds would probably be to diminish the value of their investments and hence to reduce the level of security.

A pension fund must be fully funded if it is to provide the level of security necessary for independence of the state of health of the employer. With asset values that have fallen in absolute terms as well as in real terms, and liabilities that have increased substantially because of salary increases, pension fund deficits larger than ever before have been declared recently. Another argument for funding is that it is a useful discipline and prudent practice for an employer to meet the cost of his employees' pensions as their pension entitlement accrues during their careers. Provided that there is extensive granting of back-service credit on the introduction of an assessment scheme French experience has shown it should be possible to fix initial contribution rates at something approaching their ultimate rate, in which case employers should still be able to satisfy this financial discipline.

Another traditional advantage of funding—and the one which has suffered most in recent years in the U.K.—is that contribution rates are lower than under assessmentism because of the interest earned on the investments held by the fund. As long as we have negative real rates of return on investments this 'advantage' becomes a definite disadvantage and funded scheme contribution rates become higher than non-funded scheme contribution rates. A way round this problem, other than assessmentism, might be for the government to issue stocks with index-linked yields. Some countries, for example Israel and Brazil, have done this and it would be worth enquiring into the experience of these countries.

The final main argument for funding is the resulting supply of savings available for investment. We ought at this point to remind ourselves that the primary object of pension schemes is to supply benefits to scheme members, although the provision of funds for investment is an important by-product of funded schemes. We therefore need to consider carefully the effects on investment of a departure from funding. Even if the other advantages of funding were now considered illusory and, in particular, even if investment were not profitable for a pension scheme itself, it may nevertheless be beneficial for the country as a whole. It is often argued
that funds do not provide monies for investment in new productive capacity in industry but merely swell Stock Exchange or property prices. Even if the latter were true, pension fund monies swell the total funds available for investment and thus make the raising of finance for productive activities that much easier. However the whole of the annual increase in the size of pension funds does not represent savings which would not otherwise have taken place.

The author provides an interesting table in § 6.12 which conveys the impression that France, with its non-funded pension schemes, has the highest level of investment of the four countries shown. However, the author is open to the charge of quoting selectively. If Switzerland, a country that believes strongly in the virtues of funding, had been included the corresponding figures would have been about 30%, 29% and 27% which are higher than any of the other countries shown in the table. However, this kind of international comparison is of limited validity because of all the factors other than that of pension scheme financing which would have a bearing on the level of net investment. Thus you cannot deduce from the table that funding necessarily results in more or in less capital formation, but you can infer, as the author has done, the important point that adequate total levels of investment can be achieved in an economy where pension schemes are not funded. There are numerous arguments on the necessity, or otherwise, of pension scheme funding for investment, in the economic sense, but the figures in that table show that funded pension schemes are not essential for a country to achieve adequate total levels of investment. The author therefore suggests in § 6.14 that the investment question is one which is of only subsidiary importance in any appraisal of funding. Whilst not disagreeing with the author, I would put the conclusion in a slightly different way: that the case against assessmentism on this investment question is not proven.

I would like to consider some of the consequences should the U.K. decide to adopt assessmentism as the rule for pension scheme financing. Once adopted there would be no possibility of a return to funding. Clearly, we would have to learn from the experience of other countries. In many ways the French system seems extremely cumbersome and an administrative nightmare. In § 3.29 the comment that initial pension payment delays are commonly six months and sometimes more than a year is a pretty damning indictment. Their system of schemes, which are separate yet linked by means of compensation payments, appears very complicated and the logical extension would be to have fewer, but larger, schemes or even one universal scheme. This might involve some loss of flexibility in the nature of benefits; but in practice we could question whether the needs of workers in different industries do differ appreciably. Might it not be preferable to have a universal scheme providing all members, whatever their earnings, with adequate earnings-related benefits? Any employer wishing to provide extra benefits could do so outside the main assessment scheme.

The phasing-in of assessmentism would need careful consideration. An important point is that the working population must not leave itself open to the charge of promising itself benefits of a level higher than that which it is prepared to pay existing pensioners. To achieve a sense of national solidarity, as the French call it, it would be necessary to grant extensive back-service credit, perhaps on a somewhat arbitrary basis, to existing pensioners so that the next generation of workers is not asked to pay a significantly higher contribution rate than its predecessors.

Mr F. W. Bacon: In § 5.1 the author suggests that one of the main advantages, at any rate to the beneficiaries, of assessmentism over funded schemes is the regular and automatic adjustment of pensions in course of payment to salary movements. He appears to suggest that under assessmentism such adjustments are painless, while funded schemes can only cope with inflation with very great difficulty. This needs further investigation. If we consider pensions only in a stable, mature population, by which I mean one with a constant proportion of retired to active members, then, for a given level of pensions, pension outgo equals contribution income. Under funding, pension outgo equals contribution income plus investment income. Therefore the contribution rate under funding in those circumstances will be substantially less than under assessmentism.

Consider the situation where, on top of a given level of pensions, we have an increase in pension levels due to inflation indexing. The increase will not have been funded so that, unless
the investment income in the funded schemes rises in proportion, the contribution rate will have to rise, but it will still be lower than the assessment rate so long as there is any investment income at all.

The real problem for pension funds is when they try not only to index the pensions, but also to fund the increase in past service pension liabilities for active members caused by the inflation as well as paying the increased pensions to retired members. Here an increase in inflation rates is the main cause of trouble, because a constant inflation rate, which is expected, is likely to be reflected in a higher rate of interest earned on investments. Pension funds could meet this problem of providing for the additional pension liability for active members by paying in up to the full assessment rate of contribution which, so long as there is any investment income, will leave a margin for funding the increase in past service liability.

Therefore I conclude that anything assessmentism can do, funded schemes can do better! The real difference is that under assessmentism the active population, i.e. the employers and employees, are compelled to inflation-proof pensions, whereas under funding it is voluntary. This raises the question as to whether pensioners as a class should automatically be protected against inflation, even where this has arisen through having to pay more for imports which affects everyone. My own view is that there is no case for automatically protecting pensioners in this way.

Has the author considered the possibility that assessmentism as well as protecting pensions against inflation, may also contribute to inflation? The consumption of retired people must be met out of current production, whatever the method of finance, and the danger is that under assessmentism the active population may refuse to pay the additional contributions necessary to provide the increase in purchasing power of retired people if they think that the money contributions they are being asked to pay are disproportionately high. They will not refuse overtly, of course; they will simply do so by demanding wage increases to cover the increase in money contributions as well as any increase in prices caused by employers adding their contributions on to prices. This is not just hypothetical: it has actually happened in the U.K. where the T.U.C. has made it clear that their understanding of the social contract was the maintenance of the real value of net take-home pay after tax and national insurance contributions. I do not know whether there has been a similar development in France, but so far as the U.K. is concerned, I am afraid that we cannot guarantee the continuance of inter-generation solidarity.

I should like to turn to the economic rationale for funding which is that the saving created by funding helps to finance new investment, which in turn leads to a higher production of goods out of which the consumption of retired people can be provided, without impinging on the goods available for consumption by the active population. I therefore disagree with the author's view that the supply of savings through funding is unrelated to the rationale of funding: to my mind it is of the essence of the economic case for funding.

Pension funds could still be viable even if they did not earn a positive real rate of interest, providing employees and employers are prepared to pay any extra contributions required. I do believe, however, to quote the author's words in § 6.17, that the "market economy can survive only if in the long term investors receive a positive real return on their investments". I was not clear whether the author accepted this view or not, nor am I sure whether this makes me an optimist, but I am sufficiently optimistic to believe that economic realities will triumph in the end. Even now there is a growing understanding that the fall in real returns on investment, and the consequent fall in new investment, is one of the main causes of the growth in unemployment.

I find it ironic that the author should cast doubts on the value of savings and investment at a time when industry is being castigated for not investing enough and pensions funds for not providing enough funds for investment.

Referring to § 6.23, it is not structural changes in our investment institutions that are needed to assure a real return on investment, it is a change in government and trade union attitudes so as to reverse the processes which have halved the share of profits in the national economy of the past ten years and so reduced the incentive to real investment. To abandon funding and
substitute assessmentism will not help reverse those processes; it is more likely to exacerbate them.

To sum up, assessmentism is possible under certain conditions if you have (i) a stable, mature population; (ii) compulsory membership; (iii) compensatory transfers between expanding and declining industries, and these are acceptable; (iv) employers in expanding industries are prepared to accept reductions in profits and investment, and the employees a consequent reduction in employment opportunities, by having to subsidize the declining industries' pension liabilities; and (v) the active population are willing to accept reductions in the real level of wages otherwise possible for them, in order to increase transfers to the retired population, without demanding compensating increases in money wages. I am sceptical as to whether any of these conditions, other than the first, will be fulfilled in the U.K. I must therefore conclude that any attempt to replace funded schemes by assessmentism will be economically and socially disastrous.

Mr L. W. G. Tutt, F.F.A.: In the paper, mention is made of either intolerable funding burdens or some departure from the established practice of fully funding retirement benefits (§ 1.1) and of pressure being answered not by acceptance of the heavy burden of full funding, but rather by a progressive dilution of the funding procedure (§ 6.18). That may perhaps surprise some U.K. actuaries who believe it to be generally accepted that some practices adopted elsewhere—such as the book reserve system in Germany—are not entirely suited for use in the U.K. They might ask themselves whether any practice of effectively reducing the employer's appropriate contribution rate, directly or indirectly, to enable him to assist his own business, has not been frowned upon in Britain. They may then ask how this funding dilution, as imputed by the author, has come about. From whom has all this pressure come, necessitating it to be answered in such a way as to result in progressively reducing effectiveness of pension funds in Britain in recent years?

I regard private pension scheme finance as being a matter of such breadth that conclusions should be drawn carefully, and that flexibility, responsibly applied, can produce advantageous results.

Any departure from full funding might be regarded as a paving of the way by easy steps to assessmentism, leading to the conclusion that it is assessmentism which is really wanted—a view which is, of course, already held in some quarters. There is a corollary which is that to question the need for funding private pension schemes does not leave unquestioned, in the long term, the need for funding in other spheres, such as life assurance.

Alternatively, it could be held that funding of private schemes is required and that departures under pressure from full funding should be controlled. The possible outcomes in the U.K. then correspond with the actual outcomes in the United States of America under their 1974 Act which resulted from a similar position there. The Act restricts responsibility of funding and certifying to those personally enrolled with the state, a professional qualification by itself not necessarily being adequate for enrolment; the imposition of statutory minimum funding bases, and further intervention by government by way of compulsory scheme state insurance to safeguard the security of benefits of members under private schemes.

Mr R. B. Colbran: As long ago as 1967 Mr Lynes wrote in his book French Pensions "Funding techniques have resulted in occupational schemes being confined in an actuarial straitjacket which inhibits them from fulfilling their real purpose". More recently Professor Michael Fogarty in Pensions—Where Next? wrote "The State, admittedly, has in certain respects been less than helpful to occupational pension schemes, particularly in the way it has used price and dividend controls to combat inflation and so made it harder for the investment managers of pension funds to keep pace with inflation. But the occupational pensions movement could, and should, have coped with the problem of inflation for itself and can still do so. Its failure to do so hitherto has been due to the conservatism of its methods and the ineffectiveness of its collective action, and in these respects the State need bear no blame."

It may be even more important when employers themselves begin to doubt the value of
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funding; a multinational employer I spoke to recently expressed satisfaction at having kept his funding level low. Pensions increased out of revenue are another example of an unfunded arrangement.

I have tried to compare the French system with our own. The latest figures for income and outgo of occupational schemes in the U.K. relate to 1971 and are obtained from the Government Actuary's survey. In 1971 the gross national income was about £49,000 millions while contributions and interest for occupational schemes at £2,620 millions were 5·35% of national income. Pensions and other benefits actually paid out from such schemes at £1,025 millions came to 2·46%.

I want to examine these figures against those from French complementary schemes with which our funded system is being compared. It is apparent from Appendix C that the outgo from complementary schemes amounts to 28,000 million francs which is 1·75% of the gross domestic product. This is consistent with the figure of 1·83% which was given in respect of 1971 in a paper prepared for a colloquium in 1973. Thus from French complementary schemes, which are generally regarded as mature, we have a total outgo of about 1·75% of gross national income, against 2·46% from the immature U.K. system (and 5·35% for income). However, the general and other basic schemes in France are considerably bigger than in Britain and complementary schemes represent a small proportion of the total. The valid comparison is therefore between the overall French social security system and our own combined state and occupational scheme provision since the state scheme represents a much larger proportion of the total in France. To put forward répartition as the U.K. solution is not really convincing when it represents such a small part of the total in France.

I would like to know how far the problems of poverty in old age have been solved in France. Turning to the question of funded schemes in the U.K. the supporters of an assessment system beg the real question. In a capitalist society, conventional investments give the owner a title to a share of future wealth. In France the ownership of industrial wealth by way of Stock Exchange securities is not held to the same degree as in the U.K. I must assume that, with the assets held in other ways and a different tax situation, the French have, in a more prosperous economy, been able to maintain the value of their businesses and enhance them.

In the U.K. the bulk of the ownership of business on any scale is through the Stock Exchange. I believe that the real value of the investments held by pension funds, with all the benefits of tax-free accumulation, is diminishing and the totality of accumulated wealth in the country is decreasing in real terms or, at best, increasing only at a very low rate. It is not sufficient to say that investments have a negative return because of inflation, and I will give a few generalized suggestions as to where the wealth is going. There is personal consumption and until recently wage earners were probably receiving and spending more than the economy could afford. Wealth is going in unproductive activity, particularly in the public sector, and it is going overseas in higher commodity prices and in servicing currency loans. These trends cannot continue indefinitely if our economy is to prosper or even survive in the form in which we know it. Changing pension schemes to an unfunded basis will not put the economy right.

Professor Fogarty thinks that a mixture of 'pay-as-you-go' and funding will enable occupational schemes to give generous back-service benefits, but he does not indicate where the money is to come from. The author leads us to the idea that unfunded schemes can have benefits retaining their real value, related to earnings and not merely prices. Yet, at the moment, the money saved through funding is going somewhere, much into government and some into business. If funding is stopped, this money has to be replaced, or the economy has to adapt, and someone has either to generate more wealth or give up part of their present wealth for the pensioners.

Mr B. H. Davies: As far as the economy as a whole is concerned, there is no difference between advance financial provision for pensions and 'pay-as-you-go'. The difference lies solely in the means of securing the legal title to the income that the scheme members expect in retirement: one method promises pensioners a share in future dividends and interest, the other the right to levy charges on the body of employers. The money is the same, only the name is different.
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In both cases the pensioners' income is generated by the current working population and is a reduction in the consumption of the latter. The surplus that the pensioners themselves produced was consumed many years ago. It is possible that some of this surplus may have been invested, but if so it was purely fortuitous and bears no relationship to the money the workforce decided to save in this way and the investments which were made.

Thus, what has led in this country to the adoption, outside the public sector, of what the author calls 'funding' is not its moral or financial superiority but simply because, in the absence of a legal structure appropriate to the French model, segregated assets are the only way in which pensioners can be certain of receiving what they have been promised.

Such security, whilst desirable, is only one criterion by which effective pension provision can be judged. Increasingly being regarded as of equal importance are: inflation-proofing, protection on changing jobs and back-service rights. For one reason or another the system of paying for pensions that has been adopted in this country has experienced considerable difficulty in dealing with these features.

The author has, therefore, performed a useful service in demonstrating how an answer to these problems has been found in France, whilst, and this is the important point, retaining security of retirement income. The problem in moving to such a system in this country is the difficulty of what to do about the accrued rights under the present system. A possible solution through a pay-out of existing funds points to the real difficulties that lie in the way of a change. If we discount the possibility of economic collapse—and it is important to remember that the French system grew out of economic collapse—it may be that like the French we have passed the point of no return in making the choice between funding and 'pay-as-you-go', but we have gone in the opposite direction and are locked into the funded system. However, were we to start again now it is unlikely that we would adopt the present system.

The French system is based on voluntary collective agreements between employers and unions, albeit with legislative support. They are a natural part of collective bargaining and 'pay-as-you-go' can operate through a large number of individual schemes that can vary by industry, by employer and by type of employment.

Mr C. S. S. Lyon: We need to start by asking what the objective of pension schemes is. Mr Davies said that it is to provide inflation-proof pensions including preserved rights, and I assume that he also included inflation-proofing of preserved rights.

We then have to ask whether this is attainable and I am not sure that it is. The recent brouhaha about civil service pensions points in that direction. In a period when the living standards of the active population are being depressed, is it reasonable to expect no depression at all in standards of living among the retired population? Again, the objective may be unattainable if demographic factors move sharply against maintaining the purchasing power of pensions; for example if the birthrate declines to a low level and we have to support an increasing elderly population on the basis of a slimming workforce. If it is attainable, or to the extent to which it is attainable, can it best be achieved by funding? Accrued pension rights have been devalued unless more money has been put in to maintain their value. Who benefits from this devaluation? It could be the user of the funds generated, by devaluing the debt, e.g. the government. It could be those who have to produce in order to service the funds generated by forcing up wages and hence prices, thereby devaluing the debt. If that has happened, could it have been prevented or anticipated in advance, possibly by the original contribution rate anticipating less interest than it did? It has been said already that funded contributions can be set at a lower level than assessmentism contributions, but does that make us live in Cloud Cuckoo Land? Does the funded system make it too easy for the next generation to renege on its obligations in real, if not in monetary terms?

What are the consequences of rectifying this devaluation if it has not been provided for in advance? It cannot be rectified when a scheme goes out of existence unless the fund can be invested in indexed investments or obtain a state guarantee. If there is an employer there to rectify it, he has to pay again for the liability that he thought he had funded at the time. Is this inflationary? All this leads me to pose the question of whether the discipline that we think
is greater under funded schemes is in fact greater under assessment schemes—in that case, the social discipline.

Mr T. G. Arthur, in a written contribution, which was read to the meeting: I am an out-and-out supporter of funding. I believe that most, if not all, of the arguments proposing a reduction in funding are fallacious, and I have found nothing in the paper to alter my opinions.

An article of faith among those advocating less funding is that the point of zero on the possible array of real investment returns has a special significance, and the author appears to be no exception, referring to it in §§1.3, 6.2, 6.7, 6.17, 6.18 and 6.23. However, all that can be said about any rate of return is that it is better than anything lower, and worse than anything higher, and there is no magic about the figure of nil. A drop from 10% to 1% is of far greater consequence than a drop from +1% to −1%. The tendency to save for the future will fall all the way as available returns drop. For some people, marginal saving will not be attractive if it earns +5%; others will still do it at −5%, because their time-preferences for consumption, together with their income, still point in that direction. The question of negative returns is a red herring and unrelated to funding. The correct reaction to falling returns is a revision of consumption patterns and a consequent revision of future benefits.

I am sure that the author does not join those who argue that funding is more expensive—this is purely a matter of incidence of costs—but the reference in § 6.2 to M. Dubois's paper seems to imply that the later cost advantages of advance funding never materialize under certain conditions. This is not so. Nothing, neither a chain-letter game nor a state pension scheme, goes on for ever. The advantages may well be pushed further and further into the future, but under the conditions he mentions they are correspondingly more valuable. Indeed in present-value terms, at negative real returns they are infinite. In such conditions capital investment itself becomes less desirable. A company is doing few people any good by investing operating profits in plant and machinery if positive returns are not available. The author hits the nail on the head in §6.11 it is saving, i.e. abstinence from consumption, that is questionable, but the consequence of smaller abstinence now is greater abstinence later. You can't burn the candle at both ends.

The true relevant questions are security and equity. Assessmentism replaces promises backed by physical assets with promises backed by current political institutions and current social solidarity, and the later generation is never consulted about its part of the bargain. The security of assessmentism depends heavily on state coercion as is clear from the paper. Indeed it surely requires a nimble imagination to call ARRCO a private scheme when it depends upon ministerial decrees! So far it has worked, but what about the year 2000? What will be the contribution rate then? What will happen if France's spectacular post-war growth ceases? Will solidarity weaken? And would it be shameful if solidarity did weaken? Not in my opinion. The decline in the savings ethic seems a pretty poor reason for saddling one's children with debts; it is more like an attempt to have your cake now and your cake later.

Mr R. E. Hayward: I am a confirmed funding man, as well as being actuary to several pension arrangements in countries where salary inflation rates are measured in multiples of 100% p.a. The results of any traditional kind of valuation are very difficult to interpret in such circumstances, and have led me to move well away from the traditional methods. I shall discuss the problems without offering any solutions.

Local employees in the countries I am referring to prefer lump sums to pensions. Inflation erodes the lump sums. Retired employees then seek aid from their former employers so the employers prefer to give pensions; they favour a scheme integrated with the state pension scheme to give a total package which makes up a reasonable proportion of final pay. It is funded within the company by means of balance sheet reserves.

This is all very neat and tidy on paper, but the scheme then suffers destruction in two stages. The fund is rendered meaningless each year because inflation reduces its value in terms of current money. Then growth of the state pension reduces the share which the company scheme has to pay towards the Integrated pension, and this reduces the eventual annual outlay of the
scheme to nil. This could be overcome if the company could guarantee to provide increasing pensions but the notional rate of contributions levied upon the payroll would be prohibitive on any realistic funding assumptions.

I do not like what is implied in § 3.23 about self-employed earners. The second sentence belongs to the realm of politics rather than actuarial science, and I protest in advance against any politician who excuses his government’s maltreatment of self-employed pensions by quoting this paragraph as actuarial opinion. The author is merely recording the opinion of the French government as it applies to that country and not making an actuarial statement which might apply elsewhere. The actuarial position must be that if a government can determine a quantum of earnings for the self-employed person and levy tax and pension contributions upon it, then actuaries are quite capable of calculating a fair pension expressed as a fraction of the quantum of earnings upon which the contribution was levied. The difficulties mentioned are political, not actuarial, and, if I may express a political opinion, I believe that the difficulties are based upon a hypothesis which is not provable, namely that the self-employed are inveterate tax-dodgers.

M. J.-F. Chadelat (a visitor): Il existe un droit fondamental dans notre société actuelle, il s’agit du droit à la protection sociale. Peu à peu les gouvernements de tous les pays ont créé ce droit et tous ont fait des efforts pour améliorer leur protection sociale. Ce droit est inscrit dans la déclaration universelle des droits de l’homme, il fait l’objet d’accords et de conventions. C’est pourquoi quel que puisse être son mode de financement, tout doit être mis en œuvre pour le préserver.

Il est bien évident que la protection sociale adopte de multiples formes, et varie non seulement entre les pays, mais aussi à l’intérieur d’un même pays entre les régimes. Cependant en règle générale les droits en matière de vieillesse se traduisent par la garantie du versement d’un certain montant, ou d’un certain pourcentage du salaire accordé au titre de la retraite. Or je crois qu’il est fondamental que l’assuré à qui l’on a garanti à un instant donné ce montant ou ce pourcentage, puisse avoir également la garantie de cette prestation au bout de dix ou 20 ans.

Ce que je veux indiquer par là, c’est l’importance que l’on doit accorder à l’indexation et à la revalorisation des prestations, qui seules permettent de conserver garantie d’un certain niveau de retraite, en monnaie courante.

S’il ne fallait citer qu’une seule qualité au système de répartition, ce serait sans hésitation celle de pouvoir indexer sans difficulté les prestations sur les salaires. En effet, dans un système en répartition une balance s’établit entre d’une part, les recettes qui sont les cotisations payées par les assurés et qui évoluent comme les salaires, d’autre part les prestations qui évoluent avec le montant des retraites. L’équilibre peut donc être respecté si ce deuxième facteur évolue au même rythme que les salaires.

Par conséquent la grande vertu de la répartition est de permettre une revalorisation des retraites comme les salaires, et je pense qu’il est très difficile de concevoir un autre système qui techniquement permette des taux de revalorisation aussi élevés. Ayant eu l’occasion dans le cadre des travaux Européen, d’examiner le problème de l’indexation j’ai pu vérifier que les seules fois où elle a été possible à un niveau aussi élevé, sont celles où l’on avait introduit un mécanisme de financement par répartition assurant l’équilibre entre la croissance des salaires et des retraites.

En second lieu, je voudrais vous indiquer que je considère que le problème de la répartition et de la capitalisation est un faux problème. C’est un faux problème en ce sens que ces deux systèmes n’existent pas réellement.

La répartition pure n’existe pas car tout les systèmes ont besoin de disposer d’une certaine masse de fond ne serait ce que pour leur permettre d’assurer leur trésorerie. D’autre part, j’ai eu l’occasion de constater que la capitalisation dans les cas ou elle subsiste est en réalité très atténuée. La capitalisation pure où il existe des réserves mathématiques égales à 100% de la valeur actuelle des prestations futures, constitue une exception rarissime.

C’est pourquoi je crois que la vérité se situe comme toujours entre les deux. Est-elle plus proche de l’un ou de l’autre système? Je ne veux pas relancer cette querelle. Je considère
simplement que l'on se doit de maintenir le droit fondamental que constitue l'indexation des pensions, et que le système de financement doit être choisi en fonction de la meilleure réalisation de cet objectif.

Mr M. D. Thornton, F.F.A.: It might be helpful if I gave an analogy. In time of war, the government of a country has a right to call on its citizens to serve in its armed forces. An individual can avoid that service by making his body so weak through drink or drugs that he is not worth calling upon; or alternatively he may reside in a neutral country until the emergency is past. A government has an equal right to call on the capital and savings of its citizens in time of need. Just as the fair way to call on their income is of course by income tax, so the fair way to call on their capital is by capital levy. This, however, requires greater courage than is normally to be found in governments which rely on a popular vote for their continued election. The cowardly way to make a levy on the capital of the citizens is by means of inflation. Thus a 10% annual rate of inflation is a 10% annual levy on capital and savings. Just as, in an emergency, the government has a right to call on our bodies even at the risk of death, so a popularly elected government has the right to call on our savings. Inflation inflicted on us by our government is something which we should not try to resist, except by changing government policy. Just as one wants a government which will keep one out of war, so one wants a government which will keep one free from inflation; the former requires diplomatic skill whilst the latter requires financial honesty. However, if it is necessary to call on savings by levy, and in life assurance and pension funds we have saved much money, then to try to put our savings into a more stable currency is as anti-social as residing in another country in time of war. To retreat into assessmentism so that we have nothing worth losing is a similar evasion of responsibility. The only thing worthy of inflation-proofing is the currency.

Mr J. K. Scholey: Let us first of all consider the benefits that have to be provided and then decide how we should do it, rather than putting money aside and then determining what benefits it provides.

From this point of view the employer who provides a pension scheme will be in the same position as any other saver: he is defrauded by incompetent governments which permit inflation. Pension fund trustees suffer in exactly the same way, so account of this has to be taken before deciding how and when to set aside funds against future liabilities of pensions. Many speakers have been wholly misled as to the amount which is required to be set aside. They have assumed that because we have had inflation of 20% for one year, we shall have 20% inflation for all future years. Similarly if we have interest earnings of 12% on new investments, the rate may easily go down to 5% on the same investments in the future. This is the exact reverse of the true position. Inflation may fall from 20% in one year to 15% in that following, possibly 10% in the next year and 5% thereafter. If you make an investment today at 12% on a 30 year stock, then you receive 12% for 30 years. It is this which has enabled pension funds to meet the costs of providing benefits which are geared to inflation.

I disagree very strongly with the author and those speakers who said that the pension fund industry is in a powerless condition. I believe that year by year an employer should set aside money so as to have a proper charge on his profits for pensions. I am not concerned whether or not that money is saved; it must be set aside. The avenue for saving, whilst there is inflation, may well be in an employer's own business. If there is inflation the value of that business increases. The true assets are not dissipated by inflation; it is only savings which are dissipated. Certainly an employer must set aside money during the working lifetime of employees, but there is a case for paying increases in pensions due to inflation out of revenue, which implies some degree of assessmentism. However, accountants may say that if you have embarked on paying certain pension increases you must set aside reserves to cover these, but I do not consider that the problem is insuperable.

Mr C. G. Lewin: Many people in the U.K. support the principle of funding, perhaps because they do not fully trust the state. People have their state pensions on an assessmentism basis, so
they prefer to have the supplement funded, i.e. by contracting out of part of the state scheme.

There are some indications that the assumptions we ought to be making for future funding bases ought to be even more conservative than the ones which we have made in the recent past. That is not to say that funding itself will fail, merely that we ought as a profession to re-examine our application of it.

Mr D. F. Gilley: We are talking about security: it may be that a fund represents an ice cube which melts under the hot sun of inflation; but, nevertheless, there are many circumstances in which the pension fund member is better off because he has a melting ice cube—or preferably a melting iceberg—rather than nothing at all.

That there is no such a thing as index-linked investments at least in sufficient quantity for it to be a valid funding medium means, as Mr Thornton has said, that it is possible to go on cheating the pensioners. Moreover I believe that there will not be such a thing as an index-linked investment because if you do have one you cannot cheat on pensions. If one is not prepared to have an index-linked investment, then assessmentism is unlikely to be introduced because that would have precisely the same effect.

Mr E. F. Rogers: Those whose main professional concern is the planning and financing of pensions have been so preoccupied with immediate problems in recent years that it is particularly salutary to have before us a paper which forces us to concentrate on the longer-term issues. Both Mr Davies and Mr Lyon fastened on this point and described what we should be trying to achieve, including preservation and inflation protection.

Our longer-term responsibilities should first be to work towards a fair level of retirement provision for those whose interests we represent. Pressing for too high a level of benefits or too early a retirement age may do a disservice to those we are trying to protect since it will be the future working generations who will decide whether they can reasonably be asked to bear the burdens imposed on them. This perhaps is the crux of the problem. M. Chadelat laid considerable stress on the solidarity principle of the French system. Others in the discussion have taken a different view, like Mr Arthur, who would trust the underlying security of assets rather than the pledge of future generations. Secondly, the method of financing retirement provisions should make a positive contribution to the growth of the economy. Thirdly, the financing of schemes should be arranged in ways which will offer the maximum security for the promised benefit. It is important that there should not only be fairness between generations but that it should be apparent. The acceptability of burdens, whether for tax, social security or occupational pensions contributions, depends not only on their size but also on whether they are generally regarded as equitable.

On the economic aspects, Mr Arthur made a typically forthright defence of the funded approach, and the contribution which it makes to the economy. Mr Bacon commented on the value to the economy of funded savings, and Mr Colbran raised the interesting question of whether the French economy is really all that comparable with our own. It is an interesting question because France is one of the few countries where it has been possible to secure real investment returns in recent years. I thought the paper was misleading on this point, as the opener commented. I do not think government bonds are a very good indication of what you can earn in France. For example, there are some indexed bonds, although General de Gaulle stopped further issues because he thought they did not reflect favourably on France, but that has not made the existing ones any less popular.

I would agree with the author that the economic arguments for funding can be overstated, but I also agree with those who suggest that extreme care must be taken in dismantling the existing systems. The author rightly points out that the rate of capital formation is not necessarily a determining factor in rates of economic growth, and also that rates of capital formation are not necessarily correlated with rates of savings through pensions or other long-term funds. Mr Colbran commented that you should not assume from that that assessmentism will produce better rates of capital formation. Certainly it is difficult to suggest that pension funds buying
gilt-edged securities to cover a government's deficit are contributing much to economic growth.

Mr Bacon and Mr Arthur both fastened on the author's comment in § 6.17 when he referred to the suggestions that a free market economy can survive only if long-term investors receive a positive real return on their investments, which again is fundamental to the whole debate. If real returns are not obtained in the future, the substance of business will continue to be eroded, and industrialists will be progressively less disposed to invest. Surely it is not too much to say that unless real returns are restored the free market economy will collapse. If real returns are restored, is there any reason why funded pension schemes should not remain viable?

I referred earlier to the importance of pension schemes both being fair and appearing to be fair. In this area the danger of assessment schemes seems most pronounced, although Mr Lyon pointed out the ease with which we can deprive people of their reasonable expectations under funded systems through the simple device of inflation. However, in the assessment schemes there is a danger that benefits will be increased to the point where they will impose unreasonable burdens on future generations because the financial discipline of an immediate increase in contributions is not there to stop benefit improvements or reductions in retirement age being introduced.

My colleagues in France are pessimistic about the difficulties which face them in future years as they preach financial prudence to governing bodies that are 50% composed of employee representatives.

Mr Colbran asked a question to which I also should like to know the answer: to what extent has the French system really worked in eliminating poverty? How widely spread are the benefits of their back-service pensions, which undoubtedly have been of enormous benefit to many people who could never have had comparable pensions under funded systems?

Mr Davies emphasized that the burden on future generations would be the same whether we financed our pensions through funded schemes or pay-as-you-go systems. But is there not a risk that under the latter approach the burden will appear less fair? Mr Bacon made the point that the burden in funded schemes is shared between contributions and investment income and thus the true extent of its growth is concealed.

There are also the difficulties of any major switch from funding to assessmentism in that there would appear to be vast sums available for disposal for the benefit of fund members.

The author has entitled his paper, "Assessmentism—an alternative to pensions funding?" and not "... the alternative to pensions funding?" I would align myself with the optimists and think it premature to predict the demise of funding, but if we are forced down the assessment path, I suggest that there are other models that we ought to be looking at as well as the French one. The author and Mr Davies possibly exaggerated the flexibility of the French system. One of the noticeable features of a compulsory system of this sort is that it becomes increasingly more uniform. The ARRCO systems and AGIRC system both have almost uniform contribution rates now, and I think this rigidity is inherent in the system. If there is to be a rigid system of this sort, is there really any advantage in the French approach with its enormous complexity? Is it not possible that if we were going down that road we should really be looking at something like the German model? The state is at its most effective in running large-scale uniform systems. The German scheme provides the basic provision that is available under the French system but with much less administrative complexity, and it leaves scope for a remarkably flexible system of private sector arrangements.

The President (Mr C. M. O'Brien): Much of the discussion has been in the area of economics with not as much as I expected on the social problems. There appear to be two key elements to the situation in France. First, the concept of solidarity, and the sense in which that word is normally used in the U.K. it relates to self-interest within a limited group; whereas in France and in the paper the word has precisely the opposite meaning. The second point is that, to work as it does, the system has to apply uniformly to very large numbers with the backing of either state supervision or encouragement. Again this is not the framework within which private pension funds for each employer have arisen in the U.K.
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WRITTEN CONTRIBUTIONS

Mr M. P. Cornut: It is often said that economic conditions in France after the Second World War were so bad that it was launched into assessmentism more or less against its will. Since a lot of European countries had to face the fairly same situation, why has none of them given up—at least officially—the principles of funding of private pension schemes? Actually, beyond the obvious economic conditions France was probably the sole country in the world where there was so wide a consensus between employers, unions and Government, towards the problem of retirement, that the setting up of widespread agreements made the demographic risk less dangerous than the financial one. Industry-wide schemes were established in Germany, Sweden, Holland and Norway but not to the same extent as in France.

In the United Kingdom, as in other Anglo-Saxon countries where the social attitude towards retirement was quite different, a lower degree of solidarity implies a greater extent of funding, the main reason for this lack of consensus is probably the wider development of pension schemes in the U.K. than in France where it was easier to set up a quite new system. As a proof of this reluctance to change the past, the few pension schemes established in France in the thirties are not covered by the general scheme of social security.

In short, for a comparison of funded with unfunded schemes we have to use social, political and even psychological terms rather than actuarial ones. To mix technical with non-technical considerations can lead to confer undue merits upon assessmentism. For example, the problem of preserving rights on change of employment appears so intractable in the U.K. that some people clearly think that the only solution lies in assessmentism. Actually, the solution is, whatever kind of scheme, a compulsory preservation of rights.

With the transfer of the proportional part of the fund, the inflation problem mentioned in §5.6 should not be so difficult, whether employment is changed or not. But it is perhaps unfair to interfere in the affairs of a foreign country and easier to speak of the problem than to solve it. In 1975 the rate of return, i.e. the pension transferred to a retired person by means of a contribution of one unit, was 13.3% at AGIRC (scheme for cadres) and 12.4% at ARRCO (scheme for non-cadres). If we were using the ratio active persons/non-active persons derived from the whole French population we should find a return approaching 7%. This wide difference arises because the part of the French population which is covered by these two schemes, (the salaried people in industry and trade) grew quickly (since 1968, at a rate of 5 to 6%, a year for cadres and 2 to 3%, a year for non-cadres compared with 0.8% for the whole population) and more quickly especially than the part of the population, as a whole, covered by the other schemes which themselves are more or less subsidized: state and 'para-state' employees, self-employed persons and, above all, agricultural workers (salaried or not) whose proportion to active population is still decreasing rapidly.

Obviously so great differences between rates of growth according to occupations should not persist in the future, since the constancy of a growth of 6% would mean that, in about fifty years, the French population would be entirely composed of cadres. Then a rate of return of about 8% should be regarded as an ultimate rate for AGIRC and ARRCO.

Even if the above approach is somewhat over-simplified, it illustrates the very notable influence of the evolution in number of new affiliations upon the rate of return, an influence which can be mathematically measured on certain definite assumptions (see Picot, Trans. 20 Int. Cong. Actuaries, 3, 303).

It is well known that in France the system of pensions is composed, as in most industrialized countries, of social security, with the general scheme and other basic schemes, the guarantee of which proceeds from national solidarity by means of contributions and, in case of need, of taxes too. Then there are compulsory complementary schemes the guarantee of which lies within an inter-occupational solidarity, without help from outside, and also non-compulsory group pension schemes and individual contracts which, according to the Ordonnance of 7 January 1959, make up the only pensions field that the insurance companies have the right (and it is an exclusive right) to deal in. The complementary pension schemes can only be operated by special independent institutions. Nevertheless, according to the above-mentioned legal text, the insurance companies are allowed to support these institutions so that we can find in
France a complete scale of institutions from entirely independent ones to institutions where not only the financial or technical management is handled by insurance companies but administrative and commercial management too.

In the field of complementary schemes, in most of the ARRCO institutions (and soon in all of them), the preservation of the supplementary rights, i.e. those provided by contributions which exceed the minimum level, follow special rules. These rules, which vary with the institutions, have the double aim of individualizing the risk and of strengthening the somewhat loose solidarity of these so-called supplementary schemes. In outline, the rules provide for the rate of return granted to a group affiliated with a supplementary scheme being different from the basic rate of ARRCO according to the demographic structure of the group owing to the notion of 'called' contributions; the rights granted to employees of an affiliated firm which is merged into a not-affiliated one to be preserved in various ways, usually by payment of a contribution equal to the present value of benefit claims; and if a firm ceases its activity, the 'points' granted to active and retired people without payment of contributions are generally cancelled; if this occurs before a certain number of years (generally 10 to 15) have elapsed, the acquired 'points' are reduced to the level of the employees contribution.

Insurance companies make up the field of full guarantees. Nevertheless, according to a rather peculiar legal text, the Decret of 8 March 1968, issued as an enforcement of the Ordinance of 7 January 1959, the insurance companies are allowed, to a certain extent, to deal with assessmentism, or more precisely, "to set up operations which are not guaranteed, fully or at any time, by mathematical reserves". This right arises mainly from historical reasons. The self-employed people did not benefit from a large cover under the basic schemes compared with the cadres. The professional classes are still a traditional market for life insurance companies. Encouraged by some of these companies, a few organizations called 'associations' were set up in the fifties, in accordance with the rather liberal law of 1901 which allows the foundation of an association for any purpose, to provide inter-occupational assessment pension schemes which, for lack of occupational agreement or ministerial text, were not compulsory although the leaders of these associations regard membership as morally compulsory.

It became obvious that these schemes should be regulated but the setting-up of rules was rather intricate. The first draft was prepared in 1960 but, as it dealt with all compulsory complementary schemes including those for salaried people, it came to nothing because of the interests at stake. A second text was written in 1964, the complexity of which made it unworkable. The third text, published in 1968, provides for a complete change since the insurance companies which previously had not been allowed to deal with these schemes now had the exclusive right to do so. The main rules provided by the 1968 text are that each scheme is to be composed of 2,000 members at least; that the fund must amount at least to 50% of the mathematical reserves calculated with an interest rate of 3%; that the deferred pension granted at 65 for a contribution of one unit without other benefits for spouses or children must stand between 9% and 16%; and that the annual growth rate of pensions, before or after retirement, must not be superior to the difference between the rate of wage increases and the interest rate of 3%, except if the proportion of the fund to the mathematical reserves exceeds 80%.

Because of this text, insurance companies can face adverse economic conditions temporarily at least as long as the proportion of fund to mathematical reserves remains superior to 50%. One insurance company (a state company) has set up new schemes, according to this regulation, for civil servants, farmers and certain professional people. But the regulation seems yet too stringent for the schemes in force, in spite of temporary rules providing that, up to the end of 1977, the minimum proportion of fund to mathematical reserves is brought down from 50 to 40%. In the most important of the two or three existing schemes, this ratio is actually only 35%. A permit not to comply with the regulation must be applied for every year.

Mr R. J. Myers, F.S.A.: I must say, however, that I am still not completely clear how the French operate these programmes. I wish that Mr Trowbridge had given some specific numerical examples of how individual pensions changed from year to year. It seems to me that, quite simply, the French system does not differ greatly from other indexed pension programmes.
except that the pension amounts are determined from the available funds rather than the necessary funds being collected to adjust the pensions for changes in economic conditions.

I note from Appendix A that in France the rate of increase in earnings in the last two decades has far exceeded the rate of increase of consumer prices—and likewise, the interest rate on government bonds. I certainly wonder what the explanation is for this phenomenon; perhaps it means that the workers were getting a larger share of the national product, but then this can be for only a limited time because there must be a finite asymptote somewhere.

Incidentally, I would say that the French programmes described in Mr Trowbridge’s paper are not occupational or private pension schemes but rather are really a second tier of governmental social insurance programmes. Too, I believe that if assessmentism were to be followed for private pension plans in the United States and Britain this would inevitably mean nationalization of them or, in other words, a second tier of social security.

The author (Mr J. R. Trowbridge) replied briefly to the discussion, and subsequently wrote as follows:

The paper discussed presents an explanation and a critique of pensions financing by répartition, or assessment, as practised by the French. It also presents a critique of funding in an attempt to provoke a constructive re-examination of one of the actuarial profession’s most cherished traditions. The discussion indicated that some speakers were more responsive than others to this provocation, and it is interesting to classify the speakers according to their responsiveness, as follows:

(a) Those who were ready and willing to support a thorough investigation of funding (the “critics”);
(b) Those who were uneasy at contemplating the abandonment of funding, but who nevertheless accepted that current circumstances may warrant a major change to our present way of thinking; and
(c) Those who saw no need at all to even question, let alone change, the current practice or philosophies relating to funding (the “defenders”).

It must be emphasized that the critics are not advocating any particular system of financing pensions, for neither the author nor any of the other critics yet advocates assessmentism for the U.K. The critics are in an intellectually easier position than the defenders, for they are simply questioning the status quo. At this stage of investigation the critics are giving preliminary consideration to what they believe must be considered a possible alternative to funding, on the basis of this alternative’s apparent success to date in France. This group is moving in the direction of what I would describe as rational enquiry.

The second group of speakers, while remaining generally in favour of funding, is sceptical of the applicability and viability of assessmentism in the U.K., but it is willing to pay attention to the outcome of any re-examination of funding.

The third group of speakers, the staunch defenders of funding, are perfectly convinced that we must persevere with funding, and that any discussion of alternatives is merely academic. As with devotees of, for example, political ideologies or even football teams, their commitment is largely a priori and therefore non-questionable. Once this is understood, the remarks of these speakers can be reconciled with those of the other speakers. In particular, for the defenders the only remedy for onerous funding costs, which arise when real rates of return are negative, is to institute some action designed to improve real rates of return on investments; the abandonment of funding is excluded from consideration.

The arguments against assessment proffered by the defenders warrant comment. For example, one speaker presented an argument which purported to demonstrate that, whatever the rate of inflation, the receipt of any investment income at all will ensure that funding is cheaper than assessment, and indeed that “anything assessmentism can do, funded schemes can do better”. I believe that this conclusion is erroneous, and I suggest that the argument leading to it failed to take account of the automatic indexation of pension scheme contributions. Another statement was that “all that can be said about any rate of return is that it is better than anything
lower and worse than anything higher, and there is no magic about the figure of nil”. A per-
fectly acceptable statement from someone who, come what may, is committed to funding. Once, however, the idea of abandoning funding is entertained, this statement reduces to empty polemic. There does become a magic in one particular rate: it is not necessarily a rate of nil and may well be a negative rate, but in any case it is the rate which corresponds to the demographic characteristics of the population for whom pensions could be financed by assessment instead of funding.

Much attention was given during the discussion to the question of real rates of return, and most of the defenders of funding supported a belief that the market economy as we know it can survive in the long term only if real rates of investment return are positive. One very important point was glossed over by these defenders, namely the point expressed in § 1.10: in funding pensions, it is rates of investment return relative to rates of salary inflation which have significance, not rates of investment return relative to rates of price inflation. In a society which is continually improving its technology, industry can become more efficient and less labour-intensive, and capital can become more and more productive. It is quite conceivable, therefore, that in the long term salary increases will persistently exceed price increases, but at the same time rates of investment return will be lower than rates of salary increases. Recognizing this, any statement of the conditions for survival of the market economy as we know it needs to be specific.

I believe that the objectives can and should be defined independently of the method of financing pensions, and that they should be set by the community at large, not by the actuarial profession, for they are necessarily based on social values and priorities. The actuary must operate within the ground rules accepted by the community at large; without compromising himself, he must be responsive to changes in any community values and objectives.

Until there is unanimity within the community regarding the objectives of pensions, there will continue to be irreconcilable disagreement between what I may call the old school, which takes funding for granted and all that that implies, and what may be referred to as the younger generation. I believe that the proper subject matter of the discussion is not really whether funding or assessmentism is absolutely preferable to the other, but rather the following: given the community’s objectives and priorities relating to the provision of pension benefits, and the social, economic and political institutions within which those pensions are to be provided, what is the most appropriate means of financing those benefits?
I propose to discuss certain aspects of mortality investigations which relate to the future and the character of these studies as seen in the United States of America. My remarks are intended to call attention to the sharply rising costs of more searching inquiries into death rates and to the advisability of broader approaches to mortality. Such approaches may depart from the main stream of actuarial endeavours in this field and raise new questions both of substance and methodology.

There is no research so intensive that it cannot be deployed more widely or deeply with additional effort. Actuaries are faced with difficult decisions in judging under what circumstances to stop the process of inquiry and when to continue probing in order to gain greater understanding of the biology of death. The issues involved—what information is sufficient for practical purposes and what advantages accrue from a more comprehensive view of the subject—must be dealt with on an ad hoc basis. It is nevertheless significant that most actuarial investigations of mortality have been restricted to data needed to answer practical questions and it is only rarely that actuaries (such as Beard and Redington) have pursued their inquiries beyond immediate objectives. Whereas at one time actuaries were considered to have the last word on many problems relating to mortality, in more recent years the more sophisticated analyses of death rates have come from demographers, epidemiologists and medical scientists.

In my judgement actuaries ought to extend their purview to new knowledge about death rates and new methods of statistical analyse. Both are needed to perceive the underlying biological phenomena more clearly; such interpretations can help us to visualize the possible future courses of mortality in different circumstances. Actuaries already have an advantage here since they pioneered the investigation of mortality among persons with physical impairments and diseases.

In the United States these studies go back to the 1890s when vigorous efforts were made to improve the underwriting of life insurance risks. After the business depression of the 1870s and 1880s death rates among insured lives increased and rates of rejection for life insurance climbed to as high as 15%. To reduce these high rates of rejection, studies were launched to determine the mortality among impaired lives. These culminated in the Specialized Mortality Investigation of 1901 which covered the experience of 34 companies over the previous three decades; this was probably the first large-scale attempt by actuaries and
Some Observations on Mortality Studies
doctors to collect mortality data on various types of substandard risks over a prolonged period of time.
Follow-up studies conducted by the medical profession came somewhat later. Osler was one of the prime movers in this field. Surgeons were especially interested in finding out how effective their skills were, but the follow-ups infrequently took age into account and were rarely carried beyond five years. The results of treatment for tuberculosis necessitated longer follow-up studies. These and related developments led to the discipline of biometry, whose forerunners were Pearson and Galton in England. The foremost exponent of biometry in the United States was Raymond Pearl at Johns Hopkins University.
The perspectives in biometry have changed radically over the past half century because of the emergence of the chronic diseases as the leading causes of death. When pneumonia and the infectious diseases figured prominently in the overall death toll, the emphasis was on relatively short-range observations. As heart disease and cancer gradually began to dominate the mortality spectrum, the increasing interest in the natural history of the degenerative diseases required a much longer period of observation. It was not until the close of the Second World War, however, that medical scientists took up seriously the task of investigating the long-range effects of the early symptoms of these diseases.
In the meantime some actuaries, working jointly with medical men in the life insurance business, conducted a series of large-scale mortality studies involving follow-ups extending over periods from ten to over twenty years. The Medico-Actuarial Investigation completed in 1918 laid down the pattern for subsequent studies in the United States. These included the Impairment Study 1929 and its 1931 supplement, the Blood Pressure Studies of 1925 and 1938, the Impairment Studies of 1936, 1938 and 1951 and finally the largest of them all—the Build and Blood Pressure Study of 1959. These investigations all aimed to isolate and measure the effect on mortality of specific risk factors (such as particular occupations, medical conditions, habits) as well as certain combinations of these factors. The underlying hypothesis was that each of the factors under consideration could be regarded as an independent variable. This concept was at the bottom of the numerical underwriting method which treated the total mortality risk as a linear compound of a number of independent risk factors exemplified by build, occupation, medical impairments, habits etc. Even though such a formulation was recognized to be something of an over-simplification, it worked well in the practical solution of the problem of classifying life insurance risks. The medical profession also indulged in lesser over-simplifications, perhaps because Pasteur had shown that specific organisms were the causative agents of most infectious diseases. There was a tendency to look upon most diseases as distinct entities, traceable to specific factors. It took many years before the accumulated evidence began to suggest that most chronic diseases were complicated processes of multifactoral origin and that many chronic diseases might sometimes be closely interrelated.
In the Build and Blood Pressure Study currently under way, as a sequel to
the Build and Blood Pressure Study of 1959, we have adopted a more flexible conception of medical impairments and of disease processes. We do not visualize departures from normal build and blood pressure as independent conditions but rather as symptoms associated with a more deep-seated pathological disturbance in body metabolism. We intend, of course, to tabulate the mortality experience according to variations in build and blood pressure as a guide for the underwriting of life insurance risks, but we will in addition try to obtain some better notions of the interplay between departures from normal build and blood pressure with other abnormalities, particularly the constellations of symptoms indicative of pathological processes. Our main concern in the blood pressure portion of the investigation is to find out whether or not the methods of treating hypertension used in recent decades have been effective in the long run. This question requires us to consider the significance of overweight and of hypertension in the development of many chronic diseases and also as part of the ageing process.

It is doubtful whether we will be able to answer this question from the current study or for that matter from future mortality investigations of insured lives. We are concerned because the cost of preparing medico-actuarial records on insured lives has been increasing sharply and it is therefore likely that these records will either be greatly curtailed or discontinued in the years ahead. Some economies in the conduct of mortality investigations are in prospect, but the chances are that they they cannot check the rapid rise in the cost of studies made from medico-actuarial records. One of the developments in the offing is to operate through a central agency such as the Medical Information Bureau, which has for many years functioned as a general registry into which a very large number of life insurance companies have funnelled information about impairments found on proposals for insurance. Such information has usually not been detailed enough to serve as a basis for mortality studies, because it was intended primarily to supply danger signals indicating that a particular applicant ought to be more thoroughly investigated. However, it would be feasible to assemble much more detail of the medical impairments reported on proposals, provided that the Medical Information Bureau did not divulge this information on individuals, but used it only for scientific studies.

We need to look to new sources of knowledge about the mortality associated with medical impairments and diseases. The Society of Actuaries and the Association of Life Insurance Medical Directors recently published a volume entitled Medical Risks: Patterns of Mortality and Survival* which digested and converted a variety of clinical and other mortality studies into a uniform life table pattern of mortality rates, survival rates and mortality ratios. A large amount of qualitative information was transformed into figures of interest to underwriters, actuaries and medical scientists. This approach holds out the promise of more informative mortality studies for the future.

The range of such studies could be greatly expanded if the life insurance

* Reviewed on p. 257.
business established a registry of deaths among insured lives, perhaps administered by the Medical Information Bureau. This could be done if a sizeable number of life insurance companies were to report each year the key facts relating to each death on an insured life and if such data on deaths among insured lives were kept for a prolonged period of time. With a registry of deaths among insured lives, it would be possible for physicians, hospitals and medical research centres as well as actuaries and life insurance medical directors to follow any group of insured persons with selected impairments or diseases. The registry of deaths could be consulted periodically to determine whether any death benefits had been paid on the insured lives comprising the group under study. The only information which the registry would supply would be whether a specific individual—name, date of birth, date and place of death, residence at time of death—could be identified as having had a death benefit paid. It would be up to those in charge of the mortality study to obtain the corresponding death certificate. By so limiting its function, the registry of deaths among insured lives could be operated under the same guidelines and safeguards relating to confidentiality as are prescribed for other vital statistics and health records used for research purposes.

The problem of preparing costly records for mortality investigations of persons with medical impairments or diseases can readily be solved by relying on the records which are normally prepared by physicians, hospitals and medical research centres for their own use. However, the problem of following such persons for long periods of time is not only exceedingly costly but also extremely difficult unless the individuals under study carry ordinary insurance or have served in the armed forces of the United States. The Veterans' Administration maintains a reasonably complete registry of veteran deaths.

Some organizations have succeeded by dint of great effort in following relatively small numbers of persons for long periods of time. The most notable of these have been the Framingham Study and a few similar studies such as the Albany, Los Angeles, Western Electric and Tecumseh investigations.

The most comprehensive and ambitious of these epidemiological investigations, which have relied on their own resources for the follow-up, is the Cancer Prevention Study, initiated in October 1959 by Dr E. Cuyler Hammond for the American Cancer Society. The follow-up in this study was made possible largely by the efforts of some 70,000 volunteers who normally collect funds for the American Cancer Society. The study covers about a million persons who have been traced for over 12 years.

I have had the privilege of having been associated with a number of projects relating to this study. Among the more recent of these was a mortality investigation whose objective centred on finding out whether low-tar, low-nicotine cigarettes were less hazardous to health than the cigarettes smoked ten or fifteen years ago. The death rates experienced among smokers of the low-tar, low-nicotine cigarettes were appreciably smaller, suggesting that such cigarettes are in fact less hazardous; animal experiments appear to confirm such a conclusion.
The Cancer Prevention Study illustrates a number of the important principles which need to be observed in carrying out follow-up studies. For one, it has emphasized accuracy and completeness of the data from which mortality rates are derived. Actuaries need to be reminded that mortality rates compiled from the records of insured lives may contain built-in inaccuracies. For instance, the differences in death rates between premium-paying and paid-up policies at the older ages indicate in part the incomplete reporting of deaths on paid-up contracts.

Another basic issue which has coloured much of the thinking in the Cancer Prevention Study is that some chronic diseases and reported causes of death cannot be considered as distinct biological entities. The multifactorial origins of cancer and coronary disease have been accepted as working hypothesis, but specific causes of death as given on death certificates have been used in a rather unquestioning manner. It is becoming clear that single specific causes of death are rarely tenable in old age and that they may often represent only provisional judgments at the younger ages.

An even more subtle issue on which we should perhaps focus attention is the representativeness of a particular mortality experience and the appropriateness of the control groups used to determine departures from normality. While the latter problem is not important for insurance and pension studies, where our standards of expected mortality are usually fixed, they are of critical importance in the interpretation of mortality experience for scientific purposes and in gauging the likelihood that future experience will conform to past patterns.

The fundamental point, as I see it, is to interpret mortality statistics not merely in descriptive statistical terms but rather in terms of their biological significance.
THE GILT-EDGED MARKET REFORMULATED

BY K. S. FELDMAN, B.Sc., Ph.D., F.I.A.

I. BACKGROUND

1.1. In this note it is argued that models of the gilt-edged market which are based on yield curves are unnecessarily restrictive and should not be expected to give a satisfactory statistical 'fit' in current conditions. The new model which is formulated relates market prices directly to the life and coupon without diverting into the computation of redemption yields. Indeed, it is suggested that the yield calculation destroys the inherent simplicity of the underlying equations—which follow from a simple assumption concerning the return from different portfolios. The method avoids the inconsistency inherent in the conventional analysis of discounting future investment proceeds at a uniform rate of interest when the yield curve itself implies that interest rates will vary in the future.

1.2. It is shown that the price of a stock can be represented as the present value of the net interest income and redemption proceeds. However, unlike conventional methods, a varying force of interest is employed, being the same for all stocks at any point of time. The market prices themselves define the varying rates of interest and income tax and contain an implicit forecast (on the basis of consistency) of all future prices. It must be stressed that these price projections should not be thought of as a real forecast any more than the implicit assumptions of a yield calculation forecast that the stock can be bought or sold on the yield basis throughout its life.

1.3. As formulated by Marshall and Pepper, the yield curve connects the gross redemption yields of stocks with different redemption dates or volatilities. Burman and White have formulated the adjustments required to incorporate the effect of coupon on the curves using an expectation hypothesis, and have introduced the notion of par yield curves. Hamilton gives an excellent summary of the methods used by stockbrokers on a daily basis. The papers of Grant, Brew, and Pepper and Salkin contain further theoretical extensions. Some of the ideas in Clarkson's work have been incorporated in further work by Burman et al.

1.4. If there is an exact relationship between yield and volatility, the definition of the latter immediately implies a relationship between yield and price alone (see Appendix). This position is quite untenable except as a crude approximation. If the yield curve is formulated in terms of life, this is a perfectly valid mathematical model (see § 2.6) but difficulties arise as soon as an attempt is made to reconcile the two quite separate sets of assumptions. Redemption yields are defined as the annual income that can be derived from a stock if a simple model is used to describe future levels of interest rates. This definition cannot be reconciled with the interest rate models implied by the observed yield.
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curve. These difficulties suggest that it might be more fruitful to seek a simpler relationship connecting the price of a stock with its coupon and life directly, without the diversion of yields based on assumptions known to be false. Whether the model is required for the purpose of anomaly switching exercises, or to confirm the terms of a new issue, it is the relationship between the price, coupon and life that is required.

2. THE MODEL

2.1. Some simplifying assumptions are required in the initial formulation. Consider the market to consist of a large number of stocks with fixed redemption dates and repayment at £100. For each date there are several stocks with different coupons and to avoid the problem of accrued interest, stocks are assumed to pay interest daily. All prices are therefore ‘clean’.

2.2. Consider a group of stocks with the same redemption date. By taking several different portfolios of such stocks, some will give the same interest income and redemption proceeds as others whatever uniform rate of taxation is applied to the income of the portfolios. Consider for example the three stocks

(a) Gas 3% 1990/5
(b) Funding 6% 1993
(c) Treasury 9% 1994

Ignoring for the time being the differences in redemption dates, the same income and capital will result from the purchase of £50 nominal of (a) and £50 of (c) as that of £100 of (b). This is quite independent of considerations of taxation. Given that investors follow an active policy of switching into or out of any stocks, and therefore anomalies are corrected quickly, we should expect the value of all portfolios giving the same proceeds to be the same. In this example the price of (b) should be midway between that of (a) and (c). The linearity of this relationship is demonstrated by plotting the ‘cleaned’ prices of stocks against their coupons in Figure 1.

2.3. This argument is now formulated mathematically. Suppose that the value that investors place on £100 of capital at the redemption date of a group of stocks with the same date is \( V \). The value of a unit annuity per annum payable until redemption is \( A \). Then for a stock with coupon \( g \) its price \( P \) will be

\[
P = gA + V
\]

(2.3.1)

The factors \( A \) and \( V \) could be cast into the usual form involving compound interest factors, but this is quite unnecessary. At no time is it assumed that the same uniform yield basis occurs in both \( A \) and \( V \). It is shown in the Appendix that the equation can always be written

\[
P = g (1 - t_n) a_{\mu}^l + 100 v_i^n
\]

(2.3.2)
Fig. 1: Situation on 25 March 1977
for some tax rate $t_n$ and interest rate $i$, the $a$ and $v$ functions having the usual meanings.

2.4. In other words, stocks with the same redemption date must have the same net redemption yield for some rate of tax. In the example of Figure 1 for the 1993–95 stocks the corresponding net redemption yield is 10·9% at a taxation rate of 16%. Alternatively we can say that investors put a value of 6·0 on a unit annuity payable until 1994 and a value of 22 on the redemption proceeds.

2.5. Now, consideration must be given to whether equation (2.3.1) holds for all stocks with the same redemption dates but with varying coupons which make certain stocks attractive to different classes of taxpayers. The validity of the equation clearly depends on an active market in those stocks for which the equation is to hold with all classes of investors switching between the various stocks. Now for taxed investors who deal with coupons between say 3% and 7½% market prices should satisfy

$P = g A_{taxed} + V_{taxed}$ \hspace{1cm} \text{if } g \leq 7\frac{1}{2} \% \hspace{1cm} (2.5.1)$

where $A_{taxed}$ denotes the value to an investor who pays income tax of an annuity of 1 per annum gross and $V_{taxed}$ denotes the corresponding value of £100 at the redemption date. Similarly, for gross funds

$P = g A_{gross} + V_{gross}$ \hspace{1cm} \text{if } g \geq 5\% \text{, say.} \hspace{1cm} (2.5.2)$

Provided that there are sufficient stocks with coupons between say 5% and 7½% dealt in by all classes of investors, since there is only one market price for each stock (except for special ex-dividend situations) $A$ and $V$ must be the same for all investors. Even if there are few stocks in this coupon range at a particular redemption date, arguments involving continuity will show that the relationship still holds if there are stocks with these intermediate coupons and slightly different redemption dates. Clarkson\(^{(9)}\) rejects this argument and always expects higher order terms in $g$ to take account of the differing income/capital requirements of investors with different tax positions. Our model can be considered as the limiting case of his family of equations. It is shown in the Appendix that linearity is a necessary condition for equal performance.

2.6. Thus in Figure 1 the slope measures the value of a unit annuity and the intercept the value of £100 of capital repaid at the redemption dates. In general, summing up the model in one equation

$$P(n,g) = g A(n) + V(n)$$ \hspace{1cm} (2.6.1)

where $P(n,g)$ is the 'cleaned' price of a stock with a life of $n$ and coupon $g$. $A(n)$ and $V(n)$ are factors which depend only on $n$. This simple equation replaces the usual redemption yield/yield curve relationship found by solving

$$P(n,g) = g(1 - v^n)/i + 100 v^n, \ v = 1/(1 + i)$$ \hspace{1cm} (2.6.2)

$$i = F_1(n) \text{ or } i = F_2(dP/Pdi)$$ \hspace{1cm} (2.6.3)

for some functions $F_1$ or $F_2$. 