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SOCIAL SECURITY INTEGRATION

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ABSTRACT

Dramatic changes in the social security law since 1971, most notably the introduction of automatic indexing and large benefit increases, have complicated the question of how private pension plans in the United States should coordinate with social security. Meanwhile, the passage of ERISA has changed forever the environment in which such plans operate. The intent of this paper is to offer a mathematical discussion of integration in this new environment, and to suggest some new approaches to the problem.

I. THE LEGAL FOUNDATIONS OF INTEGRATION

A. *Background*

SECTION 401(a)(4) of the Internal Revenue Code requires that a qualified plan not discriminate in favor of officers, shareholders, or highly compensated employees. Section 401(a)(5) qualifies the adjective "discriminatory" as follows: "A plan [shall not] be considered discriminatory . . . merely because the contributions or benefits . . . bear a uniform relation to . . . compensation, . . . or merely because the contributions or benefits based on . . . remuneration which is excluded from 'wages' by [social security] differ from the contributions or benefits not so excluded, or differ because of any retirement benefits created under State or Federal law."

The Internal Revenue Service, in section 1.401-3(e)(1) of its Income Tax Regulations, notes the foregoing language of the Code and goes on to say: "However, in making his determination with respect to discrimination . . . , the Commissioner will consider whether the total benefits resulting to each employee under the plan and under the Social Security Act . . . establish an integrated and correlated retirement system." A properly integrated retirement program, the Regulations continue, is one under which "differences in benefits . . . are approximately offset by the old-age, survivors and disability insurance benefits which are provided by the Social Security Act and which are not attributable to employee contributions under the Federal Insurance Contributions Act."

The Service has thus interpreted the Code to say that a benefit or contribution formula under a qualified plan may "tilt" in favor of higher paid employees, but only to the extent that the employer has paid (or will pay) for benefits under the OASDI system—not only retirement benefits but all other kinds of benefits as well. Section 1.401-3(e)(2) of the Regulations goes on to describe specifically how the IRS computed the "amount of old-age, survivors, and disability insurance benefits which may be considered as attributable to employer contributions under the Federal Insurance Contributions Act":

1. They computed the ratio of the maximum primary insurance amount in 1971 to the maximum average monthly wage for that year, and a similar ratio for the year 2010 (forty years later), and averaged the two, arriving at a result of 43 per cent. This percentage was taken to be "the rate at which the maximum monthly old-age insurance benefit is provided under the Social Security Act."
2. The value of all OASDI benefits was deemed to be 162 per cent of the value of primary old-age benefits alone, so that the value of all social security benefits in proportion to maximum average monthly wage was considered to be 162 per cent of 43 per cent, or 70 per cent.
3. Fifty per cent of social security benefits were deemed to be paid for by the employee, so that the employer-paid portion was taken as 35 per cent of maximum average monthly wage in any given year. They then rounded this figure up to 37.5 per cent so as to anticipate future increases in social security: at the time these regulations were last amended the social security law did not provide for automatic indexing as it does now.

All further IRS rules with respect to proper integration of plans with social security, most of which are embodied in Revenue Ruling 71-446, are based on this fundamental ratio of 37.5 per cent. That is, given that the employer cost of OASDI is deemed to be 37.5 per cent of maximum average monthly wage, one can (and the IRS does) use various approximate actuarial-equivalence factors to set limits on all forms of integration with social security, the details of which are familiar to most readers.

At this writing, the regulations and revenue ruling referred to above are badly out of date because of substantial increases in social security benefits and taxable wage base since 1971, so it is likely that new regulations will be considered in the near future. If the same approach toward establishing integration limits were followed in the new regulations, the following computation might result:

1. The average ratio of primary insurance amount to average monthly wage would be computed from the following table:

Year	Max AMW	Max PIA	Ratio
1976.....	$585	$364.00	0.622
2015.....	1,275	542.80	0.426
			Av. 0.524

2. The employer-provided portion of OASDI benefits would then be computed as 42.4 per cent of maximum average monthly wage (50 per cent of 162 per cent of 52.4). This percentage might then be rounded up to 45 per cent to account for future social security increases, with the result that integration limits in general would be increased by approximately 20 per cent (42.4 per cent divided by 35 per cent, or 45 per cent divided by 37.5 per cent).

This might mean, for example, a maximum social security offset of 100 per cent of primary insurance amount rather than the present 83⅓ per cent, and corresponding increases in the other limits prescribed by Revenue Ruling 71-446. Such a liberalization would be greeted warmly by most practitioners in the field of private pension plans, because it has become increasingly apparent in the last five years that IRS rules do not allow enough integration to take account of vastly improved social security benefits during the period, which benefits are of course weighted in favor of lower-paid workers.

One wonders nonetheless whether there is not a more satisfactory approach to the implementation of section 401(a)(5) of the Code. The logic of section 1.401-3 of the Regulations rests on the actuarially dubious proposition that there is a direct relationship between the taxable wage base and the amount of benefit payable from social security. Some have suggested that this section is just a pseudomathematical rationalization for retaining the magic parameter 37.5 per cent, which has endured in integration regulations for perhaps two decades (except during the brief reign of Revenue Ruling 69-4), despite great changes in the social security wage base and benefit schedule. Whether or not the logic is valid, however, it cannot be denied that the Regulations produce very complex integration rules. While various persons have proposed simplification of these rules, most have not challenged the underlying theory but instead have suggested compromising the theory in the name of simplicity, expediency, and/or tradition. Although these considerations must have some influence, the Regulations are not conceived arbitrarily by the IRS: they are and must be firmly rooted in the Code and must demonstrate a reasonable effort by the Service to administer the law. Therefore, any

argument for change must follow a logical path beginning with the Code (and its "legislative history") and progressing to reasonable and practical rules.

Let us therefore begin at the beginning.

B. *The Intent of IRC Section 401(a)(5)*

Section 1.401-3(e) of the Regulations may be dissected into three "integration hypotheses" resulting from the Service's interpretation of the intent of IRC section 401(a)(5):

1. Only that portion of the social security benefits that is paid for by the employer should be considered in judging proper integration.
2. All OASDI benefits, not just old-age benefits, should be taken into account.
3. Integration should be measured against the *cost* of social security rather than the amount of benefits payable.

That is, the private plan is considered as a collection of benefits whose total cost integrates with the employer's social security taxes.

These hypotheses can be criticized on several counts. First, as remarked earlier, section 401(a)(5) says that a plan shall not be considered discriminatory "merely because the . . . benefits . . . differ because of any retirement benefits created under State or Federal law." There is no mention here of who pays for any such retirement benefits. Suppose, for example, that social security were funded not entirely by earmarked payroll taxes but partly or wholly from general revenues, as has frequently been suggested; integration of private plans with social security would still be permissible under section 401(a)(5). Some may argue, nevertheless, that it is unfair to take the "employee's half" of social security into account, because it was provided by his own contributions. This argument implies that there is some similarity between a worker's own retirement savings, or contributions to a qualified retirement plan, and his social security taxes. The implication is false: the social security tax is just that—there is no account set up to receive and hold the employee's "contributions"; neither is there any guarantee that these "contributions" will ever result in any benefit payments whatsoever (remember that in order to receive an old-age benefit, a worker must not earn more than a certain amount each month). Clearly, the question of who pays for social security is irrelevant to the proper implementation of section 401(a)(5); the mere existence of these "retirement benefits created under . . . Federal law" is sufficient to permit integration under that section.

Second, the OASDI system provides benefits not only for retirement but also for disability and widow- and widowerhood. It also offers mothers' benefits, parents' benefits, children's benefits, lump-sum bene-

fits, and more—most of which have no counterparts in private pension plans. Yet it is with retirement benefits that integration is chiefly concerned. Therefore, the rationale for using all OASDI benefits to judge integration, rather than only old-age benefits, is unclear. This principle leads in fact to some rather awkward results. For example, although the Regulations intend to give credit for only the employer-paid half of social security benefits in setting integration limits, they nevertheless allow a plan to offset 83⅓ per cent of the old-age benefit—the justification being that the additional 33⅓ per cent is allowed because the employer must pay for orphans', widows', mothers', and disability benefits! The Code does not mention these other benefits; it specifically refers to "*retirement* benefits created under State or Federal law" (emphasis mine). It does not specifically authorize integration of widows' benefits, disability benefits, and the like.

Third, the express intent of section 401(a)(5) is to allow integration of either contributions or benefits in such a way as to provide uniformity with respect to compensation. The implication is that one should address the problem of integration directly by reference to the *retirement income* provided by social security, rather than indirectly by reference to the supposed "cost" of all OASDI benefits.

A private pension plan is not, after all, a comprehensive program of benefits which can be correlated with social security on a benefit-for-benefit basis; it is, in the words of section 1.401-1(b)(1)(i) of the Regulations, "a plan established . . . by an employer primarily to provide systematically for the payment of . . . benefits to his employees . . . after retirement." It should be judged as such when the question of discrimination arises.

C. *Proposed Integration Hypotheses*

I propose, therefore, that the old integration hypotheses be replaced by the following, which, in my opinion, better express the intent of section 401(a)(5):

1. The prime test of proper integration should be whether the retirement income provided by social security and private plan taken together are discriminatory in favor of highly compensated employees.
2. The test should not depend upon the details of social security financing.

I propose to show that these integration hypotheses can be translated into simple but equitable integration limitations, not dramatically different from those based on the old hypotheses but simpler and resting on firmer theoretical ground.

Before we can proceed to develop concrete integration rules from the

foregoing hypotheses, however, we must address the question of how much earnings social security will replace at retirement.

II. EARNINGS REPLACEMENT BY SOCIAL SECURITY

A. *Assumptions*

Because the taxable wage base—which has a cumulative effect on the average monthly wage—is indexed to rise with increases in general wage levels of social security participants, and because the benefit formula, which relates the AMW to the primary insurance amount, rises with increases in the consumer price index, any projection of social security benefits must rest on assumptions as to the future rates of increase in these two elements. A thorough discussion of such assumptions may be found in the report of the Panel on Social Security Financing,[1] which chose to assume (in January, 1975) 4 per cent annual increases in the CPI and 6 per cent increases in general wages. The same assumptions were used by social security actuaries for purposes of their 1975 long-range projections.[2] Therefore, since there is nothing we could add by raising the subject anew, let us accept the special panel's assumptions. Having thus assumed that wages in general will increase by 6 per cent a year, let us also assume that any individual employee's earnings will increase at the rate of 6 per cent a year: there is no reason to expect the average employee's own earnings to increase at a rate different from that of employees in general.

B. *The Replacement-Ratio Function*

Table 1 shows computed ratios of primary insurance amount to final earnings—"replacement ratios"—at various present earnings levels, under the following assumptions:

1. A hypothetical employee will attain age 65 and apply for a social security benefit in July of the indicated year (i.e., after the June benefit increase).
2. The CPI will increase at 4 per cent per year and will first affect the benefit table in June, 1976.
3. General wages will increase at 6 per cent per year and will first affect the wage base in 1977.
4. The employee's 1976 earnings will increase by exactly 6 per cent per year, so that his final earnings will equal $S(1.06)^n$, where S is 1976 earnings and n is the number of years remaining from 1976 to the year of retirement; and the 6 per cent increase has held true for years prior to 1976 as well.

[1] *Report of the Panel on Social Security Financing to the Committee on Finance, United States Senate, pursuant to S. Res. 350, 93rd Congress* (Washington, D.C.: Government Printing Office, February, 1975).

[2] *1975 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds* (Washington, D.C.: Government Printing Office, May, 1975), p. 35.

5. For retirements in 1976 and 1977 the employee is male (after 1977 the computation of average monthly wage is the same for males and females).

Table 1 projects these results for twenty years only, because beyond twenty years the assumed rate of inflation (4 per cent) exerts a strong influence on the replacement ratios; because the report of the Panel on Social Security Financing shows that the current benefit formula cannot be maintained under these assumptions indefinitely without peculiar results, so that there is a strong likelihood that the extraordinarily high replacement ratios which the assumptions predict after 1995 will never occur in fact; and, finally, because any projection beyond twenty years which involves compounded rates is too simplistic to be credible.

Several features of Table 1 stand out. First, the replacement ratios themselves are highly insensitive to the year of retirement; that is to say, they depend almost entirely upon present earnings. Second, for present earnings up to about $16,000 the ratios decrease with increasing salary in approximately linear fashion. Over $16,000, ratios decrease less than linearly because a high-paid employee is expected to receive the maximum primary insurance amount for his year of retirement: the numerator of his replacement ratio is constant while the denominator is proportional to present earnings.

By fitting a least-squares line to the data of Table 1 for $5{,}000 \leq S \leq 16{,}000$, we find that we can approximate the replacement ratio by the formula

$$\text{Replacement ratio} = 100PIA/S(1.06)^n = 63 - 2(S/1{,}000)\,, \qquad (1)$$

where n is the number of years from 1976 to retirement, S is 1976 earnings, and PIA is the primary insurance amount. The root-mean-square deviation of this formula from the actual ratios of Table 1 (for $S \leq 16{,}000$) is 1.3 percentage points, a remarkably good fit.

For $S > 16{,}000$ the replacement ratios can be approximated by a formula of the type

$$\text{Replacement ratio} = 100PIA/S(1.06)^n = \text{Constant}/S\,. \qquad (2)$$

For practical purposes it will be convenient to join formulas (1) and (2) together so that both the functional values and their first derivatives match. It turns out that such a juncture is possible at $S = 15{,}750$, when the constant equals 4,961. Let us therefore define a replacement-ratio function, P, as follows:

$$\begin{aligned} P = PIA/S(1.06)^n &= 0.63 - 2(10^{-5})S\,, \quad && S \leq 15{,}750 \\ &= 4{,}961/S\,, && S > 15{,}750\,. \end{aligned} \qquad (3)$$

Note that P has a continuous first derivative.

TABLE 1

SOCIAL SECURITY REPLACEMENT RATIOS (PER CENT)

YEAR OF RETIREMENT	1976 WAGES (*S*) IN $1,000's																	
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1976	51.6	47.8	45.1	43.0	41.3	39.7	38.1	36.2	34.2	32.1	30.3	28.4	26.7	25.2	23.9	22.7	21.6	20.6
1977	52.3	48.6	45.9	43.8	42.1	40.5	39.0	37.4	35.4	33.4	31.7	29.7	28.0	26.4	25.1	23.8	22.7	21.6
1978	53.1	49.4	46.8	44.7	42.9	41.4	40.2	38.6	36.7	34.5	32.5	30.6	28.8	27.2	25.7	24.5	23.3	22.2
1979	53.2	49.6	47.0	44.8	43.1	41.8	40.6	39.0	36.7	34.6	32.7	30.8	29.0	27.3	25.9	24.6	23.4	22.4
1980	53.3	49.7	47.1	45.0	43.3	42.2	41.1	39.0	36.8	34.7	32.9	30.9	29.1	27.5	26.0	24.7	23.5	22.5
1981	53.4	49.9	47.3	45.2	43.6	42.6	41.3	39.0	36.8	34.8	32.9	31.0	29.1	27.5	26.1	24.8	23.6	22.5
1982	53.5	50.1	47.5	45.4	44.0	43.0	41.2	39.0	36.8	34.8	33.0	31.0	29.2	27.6	26.1	24.8	23.6	22.6
1983	53.7	50.3	47.7	45.7	44.4	43.4	41.1	38.9	36.7	34.8	33.1	31.1	29.3	27.6	26.2	24.9	23.7	22.6
1984	53.9	50.6	47.9	45.9	44.9	43.3	41.1	38.8	36.7	34.8	33.1	31.2	29.3	27.7	26.3	24.9	23.8	22.7
1985	54.1	50.8	48.2	46.3	45.4	43.3	41.0	38.7	36.7	34.8	33.2	31.3	29.4	27.8	26.3	25.0	23.8	22 7
1986	54.3	51.0	48.4	46.8	45.7	43.2	40.9	38.7	36.7	34.9	33.3	31.3	29.5	27.9	26.4	25.1	23.9	22.8
1987	54.6	51.2	48.7	47.4	45.6	43.1	40.8	38.6	36.7	34.9	33.3	31.4	29.5	27.9	26.4	25.1	23.9	22.8
1988	54.9	51.5	49.1	47.9	45.6	43.0	40.7	38.6	36.7	34.9	33.3	31.4	29.6	27.9	26.4	25.1	23.9	22.8
1989	55.2	51.8	49.6	48.4	45.5	42.9	40.6	38.6	36.7	34.9	33.4	31.4	29.6	28.0	26.5	25.2	24.0	22.9
1990	55.4	52.1	50.2	48.3	45.4	42.8	40.6	38.6	36.6	34.9	33.4	31.5	29.6	28.0	26.5	25.2	24.0	22.9
1991	55.7	52.5	50.8	48.3	45.3	42.7	40.5	38.5	36.6	34.9	33.4	31.5	29.6	28.0	26.5	25.2	24.0	22.9
1992	56.1	52.9	51.4	48.2	45.2	42.7	40.5	38.5	36.6	34.9	33.5	31.5	29.7	28.0	26.5	25.2	24.0	22.9
1993	56.4	53.5	51.7	48.2	45.1	42.6	40.5	38.4	36.6	34.9	33.5	31.6	29.7	28.0	26.6	25.2	24.0	22.9
1994	56.8	54.2	51.6	48.1	45.1	42.6	40.4	38.4	36.6	35.0	33.5	31.6	29.7	28.1	26.6	25.3	24.1	23.0
1995	58.0	55.7	52.1	48.4	45.4	42.9	40.7	38.7	36.9	35.3	34.0	32.0	30.1	28.4	26.9	25.6	24.4	23.3

For the discussion that follows we shall assume that P exactly represents the ratio of PIA to final earnings for all years of retirement after 1975. The utility of this function is that it eliminates the host of variables that enter into the computation of social security benefits and, with a very high degree of accuracy, projects the social security benefit on the basis of present earnings S alone.

III. INTEGRATION THEORY AND ITS APPLICATIONS

A. *Integration of Defined Benefit Plans*

1. GENERAL THEORY

Denote the annual amount of an employee's retirement income from social security at age 65 by PIA. Also, let B represent the projected annual pension from the private plan at age 65, assuming a 6 per cent earnings increase. As before, let S be present (1976) annual earnings. Because PIA is a function of S, the total retirement income from both plan and social security, $B + PIA$, is also a function of S, so the total replacement ratio, R, may be defined as

$$R = (B + PIA)/S(1.06)^n , \tag{4}$$

where n is the number of years from 1976 to the year of retirement. The integration hypotheses (Sec. I, C) dictate that R be a strictly nonincreasing function of S; that is to say, the total replacement ratio for high-paid employees must not be more than that for low-paid employees. In mathematical terms this requirement can be expressed as

$$\frac{\partial R}{\partial S} \leq 0 \tag{5}$$

for all values of S. Formula (5) is the fundamental expression of what we shall call the "integration criterion" (IC) for defined benefit plans.

Note that formulas (3) and (4) imply

$$R = B/S(1.06)^n + P , \tag{6}$$

so that formula (5) is equivalent to

$$\frac{\partial B}{\partial S} - \frac{B}{S} \leq S(1.06)^n \left(- \frac{\partial P}{\partial S} \right) . \tag{7}$$

Referring to formula (3), we can now rewrite the IC for defined benefit plans as

$$\begin{aligned} \frac{\partial B}{\partial S} - \frac{B}{S} &\leq 2S(1.06)^n(10^{-5}) , \qquad S \leq 15{,}750 \\ &\leq \frac{4{,}961}{S} (1.06)^n , \qquad S > 15{,}750 , \end{aligned} \tag{8}$$

which in many cases is a more convenient form than formula (5) or formula (7). A plan may be considered properly integrated with social security only if it satisfies the IC.

2. APPLICATIONS

We shall now apply the IC to various types of benefit formulas to illustrate the derivation of specific integration rules.

a) Types of Benefit Formulas

Defined benefit plans fall into two main categories, namely, final-pay and career-pay plans. Final-pay plans relate benefits to earnings just before retirement or an average of earnings over a fixed number of years before retirement. Career-pay plans define the benefit at retirement as an accumulation of unit benefits based on the employee's compensation in each year of plan participation—thereby in effect basing the ultimate retirement benefit on average earnings over the employee's entire period of participation. Among final-pay plans, integration with social security is generally accomplished either by directly offsetting a portion of the primary insurance amount ("offset" formula) or by excluding earnings under a certain level from the benefit formula ("excess" formula). Plans that express the benefit as a percentage of salary up to a certain level plus a higher percentage of the portion of salary in excess of the level may be considered two plans—an unintegrated plan and an excess plan—so one need not address these "step-rate" plans as a separate class. Although a career-pay offset plan is possible, it is seldom seen, integration under career-pay plans being almost universally of the excess variety.

Therefore, we shall demonstrate the application of the IC for defined benefit plans to three "standard" benefit formulas, namely, (1) final-pay offset, (2) final-pay excess, and (3) career-pay excess. We shall defer until later consideration of the application of the IC to "nonstandard" defined benefit plans.

b) Final-Pay Offset Formula

The standard final-pay offset formula provides a benefit at retirement equal to $100p$ per cent of final pay minus $100q$ per cent of PIA. Final pay is defined as the highest average of k consecutive years' pay over some portion of the employee's career. But since we are assuming 6 per cent annual pay increases (cf. Sec. II, 4) both retrospectively and prospectively, final pay may be expressed as

$$\text{Final pay} = S(1.06)^n \ddot{a}_{\overline{k}|}/k\,, \tag{9}$$

so that the benefit at retirement is

$$B = pS(1.06)^n \ddot{a}_{\overline{k}|}/k - q(PIA)\,. \tag{10}$$

By requiring that the IC (7) be satisfied by formula (10), we can determine what limits if any must be placed on the parameters p, q, and k in order that the plan be properly integrated. First, note that

$$\frac{\partial B}{\partial S} - \frac{B}{S} = q\left[(1.06)^n P - \frac{\partial}{\partial S}(PIA)\right] \tag{11}$$

and

$$\frac{\partial}{\partial S}(PIA) = (1.06)^n P + S(1.06)^n \frac{\partial P}{\partial S}, \tag{12}$$

so we can write formula (11) as

$$\frac{\partial B}{\partial S} - \frac{B}{S} = qS(1.06)^n\left(-\frac{\partial P}{\partial S}\right), \tag{13}$$

which satisfies the IC (7) only if $q \leq 1$.

Therefore, an offset formula is properly integrated if it does not offset more than 100 per cent of PIA. This is true regardless of the averaging period k and regardless of the value of p. The fact that p and k are of no consequence suggests that career-pay offset formulas would fall under the same limitation.

c) Final-Pay Excess Formula

The standard formula of this type provides a benefit of $100p$ per cent of the excess of final pay over the social security wage base in effect at retirement. Thus

$$B = p[S(1.06)^n \ddot{a}_{\overline{k}|}/k - SSWB_n], \tag{14}$$

where $SSWB_n$ is the social security wage base at retirement. For practical purposes we can take

$$SSWB_n = 15{,}300(1.06)^n, \tag{15}$$

by ignoring the fact that increases in the wage base are always rounded to the nearest whole multiple of $300. Therefore,

$$B = p(1.06)^n(S\ddot{a}_{\overline{k}|}/k - 15{,}300), \tag{16}$$

and

$$\frac{\partial B}{\partial S} - \frac{B}{S} = \frac{p(15{,}300)(1.06)^n}{S}. \tag{17}$$

We can assume that $S > 15{,}300$, because otherwise there would be no benefit payable from the plan. Therefore, the IC may be expressed as

$$\frac{p(15{,}300)(1.06)^n}{S} \leq S(1.06)^n\left(-\frac{\partial P}{\partial S}\right), \tag{18}$$

which implies that

$$p \leq \frac{S^2}{15{,}300}\left(-\frac{\partial P}{\partial S}\right) = \frac{(15{,}300)^2}{15{,}300}(2)(10^{-5}) = 0.306 \qquad (19)$$

in the worst case, $S = 15{,}300$.

So a final-pay excess formula of the standard type is properly integrated only if it does not provide more than 30.6 per cent of excess final pay. Note that, here again, the averaging period k does not affect the proper integration of the formula.

d) Career-Pay Excess Formula

In standard form, this formula provides a unit of normal retirement pension equal to $100p$ per cent of the excess of the current earnings over the current social security wage base in each year of participation. Therefore, the benefit at retirement is the sum of all such units:

$$\begin{aligned} B &= AB\,, && n = 0 \\ &= AB + \sum_{t=0}^{n-1} p[S(1.06)^t - SSWB_t]\,, && n > 0\,, \end{aligned} \qquad (20)$$

where $SSWB_t$ is the wage base in year t, and AB represents the accrued benefit at the 1976 plan anniversary.

The presence of AB in equation (20) presents a small problem. We cannot say properly that AB is unrelated to S, but, on the other hand, we cannot simply assume that the benefit formula has remained constant for all prior years, since it is a common practice with career-pay plans to "update" them from time to time to adjust for inflation. Nevertheless, we can be reasonably sure that AB is not discriminatory in favor of the higher-paid, since any formula changes in prior years were under the purview of prior integration rules. Let us therefore assume that AB is a function of S which satisfies the IC (7) for immediate retirements (i.e., for $n = 0$):

$$\frac{\partial(AB)}{\partial S} - \frac{AB}{S} \leq S\left(-\frac{\partial P}{\partial S}\right). \qquad (21)$$

We now need concern ourselves only with the case $n > 0$. Let us again ignore the rounding of increases in the wage base and rewrite equation (20) as

$$\begin{aligned} B &= AB + \sum_{t=0}^{n-1} p(S - 15{,}300)(1.06)^t \\ &= AB + p(S - 15{,}300)s_{\overline{n}|0.06} \end{aligned} \qquad (22)$$

for $n > 0$. We can then express the IC as

$$\frac{\partial B}{\partial S} - \frac{B}{S} = \frac{\partial (AB)}{\partial S} - \frac{AB}{S} + \frac{p(15{,}300)s_{\overline{n}|}}{S} \leq S(1.06)^n \left(-\frac{\partial P}{\partial S}\right), \tag{23}$$

or

$$\frac{p(15{,}300)s_{\overline{n}|}}{S} \leq S(1.06)^n \left(-\frac{\partial P}{\partial S}\right) - \left[\frac{\partial (AB)}{\partial S} - \frac{AB}{S}\right]. \tag{24}$$

The lowest limit on p will occur when formula (21) is an exact equality and $S = 15{,}300$; that is, the "worst-case" form of the IC is

$$p \leq \frac{15{,}300(2)(10^{-5})[(1.06)^n - 1]}{s_{\overline{n}|0.06}} = 0.06(15{,}300)(2)(10^{-5}) = 0.018\,. \tag{25}$$

We conclude that a career-pay excess plan is properly integrated only if the benefit percentage p does not exceed 1.8 per cent, and that this rule is independent of the number of years n remaining until retirement.

B. *Integration of Defined Contribution Plans*

1. GENERAL THEORY

It would not be fair to place integration limitations on defined contribution plans by referring to the total replacement ratio, because the latter is dependent upon the effective rate of investment return, i, experienced by an employee's account during his active years in the plan: if we limited the replacement ratio, we would indirectly place a ceiling upon the rate of investment return—contrary to the intent of defined contribution plans to credit all investment results to the employee's account. On the other hand, retirement benefits from social security are expressed in defined benefit terms. Let us first, therefore, examine the function PIA to see whether we can derive from it a reasonably equivalent defined contribution formula.

To do so, we shall need to assume a rate of investment return consistent with the assumptions already adopted. Rather than belabor this point, let us agree, for the sake of argument, that a proper rate of investment return is 3 percentage points higher than the assumed rate of inflation, the 3 per cent representing the inflation-free rate of return on high-quality investments. This means that we should assume a rate i equal to 3 per cent + 4 per cent = 7 per cent. Let us further hypothesize a function Q which represents the rate of contribution which will exactly produce a

retirement pension equal to PIA as defined by formula (3). Thus, for an n-year career,

$$\sum_{t=0}^{n-1} QS(1.06)^t(1.07)^{n-t} = PIA(I\ddot{a}_{65}^{(12)}) = S(1.06)^n P(I\ddot{a}_{65}^{(12)}) , \quad (26)$$

where $I\ddot{a}_{65}^{(12)}$ represents the value of a life annuity which increases at 4 per cent per year (because social security benefits rise in proportion to the CPI). Formula (26) reduces to

$$Q(1.07)^n \ddot{a}_{\overline{n}|j} = P(1.06)^n I\ddot{a}_{65}^{(12)} , \quad (27)$$

where $j = 1.07/1.06 - 1 = 0.0094339$. Thus we can write

$$Q = P(I\ddot{a}_{65}^{(12)}/\ddot{s}_{\overline{n}|j}) . \quad (28)$$

So Q is proportional to P. If we take $n = 40$, we find that $\ddot{s}_{\overline{n}|j}$ is equal to 48.8, and $I\ddot{a}_{65}^{(12)}$ computed on the 1971 Group Annuity Mortality Table (for example) is equal to 11.7. We can therefore reasonably define

$$Q = (11.7/48.8)P = 0.240P . \quad (29)$$

Let R be the total contribution rate from the plan and from social security:

$$R = (C + QS)/S = C/S + 0.24P , \quad (30)$$

where C represents the dollar amount of plan contribution as a function of S. Note that this definition of R is analogous to equation (4). Proper integration requires that R be a nonincreasing function of S, that is,

$$\frac{\partial R}{\partial S} \leq 0 , \quad (31)$$

which is the fundamental expression of the IC for defined contribution plans. Combining formulas (30) and (31) with (3) yields a more convenient expression for the IC:

$$\begin{aligned} \frac{\partial C}{\partial S} - \frac{C}{S} \leq 0.24S\left(-\frac{\partial P}{\partial S}\right) &= 0.48S(10^{-5}) , \quad S \leq 15{,}750 \\ &= \frac{1{,}191}{S} , \quad S > 15{,}750 . \end{aligned} \quad (32)$$

2. APPLICATION

Since the only means of integrating a defined contribution plan (other than a "target benefit" plan, which we shall discuss later) is to have an "excess" contribution formula, we shall illustrate the application of IC for defined contribution plans with a formula of this type. The "stan-

dard" excess contribution formula is $100p$ per cent of the excess of current pay over the current social security wage base, that is,

$$C = p(S - 15{,}300) . \tag{33}$$

Applying the IC for defined contribution plans as given by formula (32), we obtain

$$\begin{aligned} \frac{\partial C}{\partial S} - \frac{C}{S} = \frac{15{,}300p}{S} &\leq 0.48S(10^{-5}) , \quad S \leq 15{,}750 \\ &\leq \frac{1{,}191}{S} , \qquad S > 15{,}750 . \end{aligned} \tag{34}$$

First consider the case $S > 15{,}750$. Here formula (34) reduces to $p \leq 1{,}191/15{,}300 = 0.078$. In the second case, $S \leq 15{,}750$, formula (34) reduces to

$$p \leq 0.48S^2(10^{-5})/15{,}300 . \tag{35}$$

But $S > 15{,}300$, because otherwise there would be no contribution, so

$$p \leq 0.48(15{,}300)(10^{-5}) = 0.073 . \tag{36}$$

Therefore, a defined contribution formula of the standard type is properly integrated only if the excess contribution rate does not exceed 7.3 per cent.

C. *Comparison with Revenue Ruling 71-446*

Before proceeding with a discussion of the finer points of integration, it will be interesting to see how the integration rules so far established compare with those prescribed by Revenue Ruling 71-446, and with those which would result if the present integration limits were increased by 20 per cent across-the-board. A comparison is presented in the accompanying tabulation.

	Revenue Ruling 71-446	120% of 71-446	Anderson
Offset	83⅓ %	100 %	100 %
Final-pay excess	17.2*	20.6	30.6
Career-pay excess	1.4	1.7	1.8
Defined contribution	7.0	8.4	7.3

* 0.375(7,020/15,300).

This comparison shows clearly one of the reasons for the trend in recent years toward offset integration in final-pay plans: when a pension plan is viewed in terms of replacement ratios, more integration is allowed by

Revenue Ruling 71-446 under an offset formula than under an excess formula. This fact does not imply that the integration limits set by Revenue Ruling 71-446 are mutually inconsistent; it merely reflects the fact that they were developed with reference to the "cost" of social security, whereas most people look at social security as a means to replace income at retirement. My proposed integration rules would redress the balance between the two types of final-pay formulas. Integration under offset and career-pay plans would be approximately that which would be allowed under the hypothetical updating of Revenue Ruling 71-446 discussed in Section I, A, and generally the proposed integration limits do not represent a sharp break with the past.

IV. REFINEMENTS AND PRACTICAL CONSIDERATIONS

A. *Nonstandard Formulas*

The benefit and contribution formulas discussed in the preceding section are called "standard" formulas because they are integrated with the social security wage base and the primary insurance amount in effect at the time the formula is applied. Other formulas we shall call "nonstandard." Nonstandard formulas fall into two categories: (1) excess formulas with integration levels different from the current social security wage base and (2) offset formulas referring to obsolete social security benefits. While the integration theory readily yields integration limits for standard plans, some compromise of the theory will be found necessary for nonstandard formulas.

1. EXCESS FORMULAS

The language of IRC section 401(a)(5) (see Sec. I, A, of this paper) implies that the integration level of an excess formula cannot exceed the social security wage base, so our concern is with integration levels less than the current wage base. For example, application of the IC to a defined benefit excess formula integrated at a constant level (i.e., not automatically floating upward with increases in the social security wage base) should produce integration limits different from those established for the standard excess formula.

One nonstandard excess formula, however, deserves immediate attention: a final-pay formula integrated at "covered compensation," as that term is defined by Revenue Ruling 71-446.[3] Such a formula utilizes a floating integration level but one which is not equal to any particular social security wage base. Table 2 shows projected values of the wage base

[3] "Covered compensation" is 12 times the maximum average monthly wage possible for a male retiring at age 65 in a given calendar year.

TABLE 2

COVERED COMPENSATION AND WAGE BASE

Year	Covered Compensation	Wage Base	Ratio	Year	Covered Compensation	Wage Base	Ratio
1976....	$7,020	$15,300	0.459	1996....	$19,260	$48,600	0.396
1977....	7,608	16,200	0.470	1997....	20,508	51,600	0.397
1978....	8,232	17,100	0.481	1998....	21,840	54,600	0.400
1979....	8,676	18,000	0.482	1999....	23,268	57,900	0.402
1980....	9,120	19,200	0.475	2000....	24,780	61,500	0.403
1981....	9,576	20,400	0.469	2001....	26,400	65,100	0.406
1982....	10,056	21,600	0.466	2002....	28,080	69,000	0.407
1983....	10,536	22,800	0.462	2003....	29,856	73,200	0.408
1984....	11,028	24,300	0.454	2004....	31,728	77,700	0.408
1985....	11,532	25,800	0.447	2005....	33,720	82,500	0.409
1986....	12,060	27,300	0.442	2006....	35,856	87,600	0.409
1987....	12,600	28,800	0.438	2007....	38,136	93,000	0.410
1988....	13,164	30,600	0.430	2008....	40,536	98,700	0.411
1989....	13,740	32,400	0.424	2009....	43,044	104,700	0.411
1990....	14,340	34,200	0.419	2010....	45,660	111,000	0.411
1991....	14,964	36,300	0.412	2011....	48,432	117,600	0.412
1992....	15,612	38,400	0.407	2012....	51,360	124,800	0.412
1993....	16,284	40,800	0.399	2013....	54,456	132,300	0.412
1994....	16,980	43,200	0.393	2014....	57,744	140,100	0.412
1995....	18,084	45,900	0.394	2015....	61,236	148,500	0.412

and covered compensation for the next forty years, under the same assumptions used to prepare Table 1.

From Table 2 we can infer the following approximation

$$\begin{aligned} \text{Covered compensation} &\approx 0.4(SSWB_n) \\ &\approx 0.4(15{,}300)(1.06)^n \\ &= 6{,}120(1.06)^n . \end{aligned} \tag{37}$$

Consider a final-pay excess plan integrated at covered compensation. The benefit percentage is $100p$, and salary is averaged over the highest k years, so the benefit at retirement is found by

$$B = p[S(1.06)^n \ddot{a}_{\overline{k}|}/k - 6{,}120(1.06)^n] . \tag{38}$$

The IC in this case is, from formula (8),

$$\frac{\partial B}{\partial S} - \frac{B}{S} = p(1.06)^n \frac{6{,}120}{S} \leq 2S(1.06)^n(10^{-5}) , \tag{39}$$

or

$$p \leq 2S^2(10^{-5})/6{,}120 , \tag{40}$$

where we have assumed $S \leq 15{,}750$. But from Table 2 we see that S cannot be less than the 1976 covered compensation of $7,020, so the

lowest value for the right-hand side of formula (40) occurs when $S = 7{,}020$. Thus we have

$$p \leq 2(7{,}020)^2(10^{-5})/6{,}120 = 0.161\,, \tag{41}$$

indicating a limit of 16.1 per cent.

How can it be, though, that the IC implies a limit of 30.6 per cent for a standard excess plan, but only half that amount for a plan which appears at first glance to be even more favorable to the lower-paid than the standard version? This apparent paradox arises out of the strictness of the IC: replacement ratios must be strictly nonincreasing with increasing salary. The effect of this can be illustrated by a numerical example. Suppose that we were to allow 30.6 per cent on a final-pay excess plan integrated at covered compensation. For an employee retiring in 1976, let the benefit formula be based on final year's pay (just to keep it simple), so that

$$B = 0.306(S - 7{,}020) \tag{42}$$

and

$$PIA = PS\,; \tag{43}$$

thus the total replacement ratio from the plan and social security for such an employee would be expressed by

$$R = (B + PIA)/S = 0.306 - 2{,}148/S + P\,. \tag{44}$$

Assuming that $S \leq 15{,}750$, we have

$$R = 0.936 - 2S(10^{-5}) - 2{,}148/S\,. \tag{45}$$

If we apply elementary calculus to R, we find that it reaches a maximum value at $S = 10{,}363$:

S	R
7,020	0.490
10,363	0.521
15,300	0.490

Thus, if we were to allow a limit of 30.6 per cent on such a plan, the benefits would discriminate in favor of employees earning more than covered compensation but less than the current social security wage base. The IC prohibits this, however, as discrimination in favor of the highly compensated employees.

A strict application of the IC, therefore, would place lower limits on excess plans integrated at levels under the current wage base. But common sense tells us that this slight discrimination in favor of middle-salaried employees is not the sort the Code intends to proscribe. Moreover, there is a precedent for ignoring this technical "discrimination" and

allowing the maximum integration limit for an excess plan which integrates at any level lower than the current wage base.

The reader may remember than when Revenue Ruling 69-4 was published in draft form for public comments, it proposed to place more stringent limits on plans integrated below the maximum "applicable integration level" (that is, covered compensation in the case of final-pay excess plans). The reason was the same as illustrated above: not to do so resulted in technical discrimination in favor of certain employees earning less than the maximum integration level. But in the final published version of the revenue ruling, this strict interpretation of "discrimination" was relaxed. Public reaction to the draft ruling persuaded the IRS to allow the same integration differential for any integration level below the maximum, because (*a*) no real discrimination would result, (*b*) enforcement of the stringent interpretation would cause hardship for existing plans that were properly integrated under prior rules, and (*c*) it would force such plans (for example, those integrated at a flat $4,800) to adopt complicated, multilevel formulas in order to avoid reducing benefits for some employees while at the same time satisfying the proposed integration rules. The principle of allowing the integration limitations to apply to any integration level under the maximum applicable one was continued in Revenue Ruling 71-446.

It should be remarked that the anomalous result illustrated for a final-pay excess plan would have counterparts for other types of excess formulas, whether defined benefit or defined contribution: lower integration limits would apply whenever the integration level was less than the current social security wage base. Therefore, in the interests of simplicity and continuity, I propose to override the IC for such nonstandard *excess* formulas, and to allow the integration limits for the "standard" formula to apply regardless of the integration level.

2. OFFSET FORMULAS

There are many offset plans in existence today which have been amended so as to "freeze" the offset to be all or a portion of the primary insurance amount under a superseded social security law. These obsolete primary insurance amounts are uniformly lower than those under the current law, so, if we applied the IC to them, we should deduce an integration limit greater than the 100 per cent derived for the standard offset formula.

On the other hand, in practice many such plans do not compute the offset properly; often it is determined by simply entering the social security benefit table under the superseded law, using current pay as the

average monthly wage—thus overstating the amount of offset. Computing the primary insurance amount properly under an obsolete social security law presents many practical problems, not the least of which is that information about superseded benefit provisions is not readily available.

These two considerations have offsetting effects on the amount of allowable integration, so I propose that the limit for offset plans be 100 per cent of the primary insurance amount regardless of the version of the social security law on which the primary insurance amount is computed. Such a practical compromise would have the beneficial effect of discouraging the continuation of benefit formulas referring to obsolete social security laws; they are difficult for the layman to comprehend, and the same amount of benefit can be closely reproduced by a step-rate formula. In any case, offsetting more than 100 per cent of any other retirement pension violates one's sense of fair play.

B. *Adjustments for Other Plan Provisions*

We now turn our attention to what adjustments, if any, to the integration limits so far established are required to take account of other provisions, such as

1. Normal retirement age other than age 65.
2. Early retirement.
3. Definition of final-average pay.
4. Employee contributions.
5. Variable or CPI-indexed benefits.
6. Preretirement death benefits.
7. Normal form of pension other than straight life annuity (i.e., postretirement death benefits).
8. Disability benefits.

Under defined contribution plans none of these features has any effect, because the benefits payable under such plans are restricted to those provided from the employee's own account. Therefore in this section we shall be referring only to defined benefit plans.

1. NORMAL RETIREMENT AGE GREATER THAN 65

If B is the benefit payable at normal retirement age y (>65), then an employee who elected to retire "early" at age 65 would be eligible for a benefit equal to $B' = fB$, where

$$f = N_y^{(12)}/N_{65}^{(12)} < 1 . \tag{46}$$

If B satisfies the IC (7), then

$$f\left(\frac{\partial B}{\partial S} - \frac{B}{S}\right) = \frac{\partial B'}{\partial S} - \frac{B'}{S} \leq fS(1.06)^n\left(-\frac{\partial P}{\partial S}\right), \qquad (47)$$

which, since $f < 1$, means that B' also satisfies the criterion, so there is at least no decrease in allowable integration.

Under the present social security law, however, the primary insurance amount is increased by 1 per cent for each year of delayed retirement beyond age 65 (up to a maximum of seven), so the function P should be increased by a similar factor in the IC; that is, for $65 < y \leq 72$ the IC could be restated as

$$\frac{\partial B}{\partial S} - \frac{B}{S} \leq (1.01)^{y-65}S(1.06)^n\left(-\frac{\partial P}{\partial S}\right), \qquad (48)$$

the right-hand side of which is greater than that of formula (7) by a factor of $(1.01)^{y-65}$. Under excess formulas (Secs. III, A, 2, *a* and *b*), the excess percentage p is a factor of $\partial B/\partial S - B/S$ (if we assume that it is a factor of AB in eq. [23]), so the limit on p would be increased by the same factor. Offset plans, which would presumably offset a portion of the actual primary insurance amount, would not be affected by this adjustment.

2. NORMAL RETIREMENT AGE LESS THAN 65

"Normal retirement age" means the earliest age at which an employee is eligible for an immediate pension which is not subject to some sort of actuarial reduction. Therefore, plans which purport to have a normal retirement age of 65, but which do not reduce benefits for "early retirement," would be deemed to have a normal retirement age equal to the lowest retirement age for which there is no reduction. If y (<65) is the normal retirement age, and B is the benefit payable at that age, then the plan could be considered equivalent to one whose normal retirement age was 65 and whose benefit was B', where

$$B' = BN_y^{(12)}/N_{65}^{(12)}. \qquad (49)$$

We require that B' satisfy the criterion

$$\frac{\partial B'}{\partial S} - \frac{B'}{S} \leq S(1.06)^{n+65-y}\left(-\frac{\partial P}{\partial S}\right), \qquad (50)$$

because n is the number of years until retirement at age y, while the deferred pension would be payable $65 - y$ years later. Formula (50) is

equivalent to

$$\frac{\partial B}{\partial S} - \frac{B}{S} \leq \frac{N_{65}^{(12)}}{N_y^{(12)}} (1.06)^{65-y} S (1.06)^n \left(- \frac{\partial P}{\partial S} \right). \tag{51}$$

That is, the normal integration limits on excess plans would be reduced by application of the factor

$$A(y) \equiv (N_{65}^{(12)}/N_y^{(12)})(1.06)^{65-y}. \tag{52}$$

Table 3 shows values of the function $A(y)$, assuming 7 per cent interest (see Sec. III, B, 1) and mortality according to the 1971 Group Annuity

TABLE 3

SAMPLE VALUES OF $A(y)$

y	$N_{65}^{(12)}/N_y^{(12)}$	$(1.06)^{65-y}$	$A(y)$	$(0.95)^{65-y}$	Δ
65.....	1.000	1.000	1.000	1.000	0.000
64.....	0.892	1.060	0.946	0.950	0.004
63.....	0.798	1.124	0.897	0.902	0.005
62.....	0.716	1.191	0.853	0.857	0.004
61.....	0.644	1.262	0.813	0.815	0.002
60.....	0.581	1.338	0.777	0.774	−0.003
59.....	0.525	1.419	0.745	0.735	−0.010
58.....	0.476	1.504	0.715	0.698	−0.017
57.....	0.432	1.594	0.688	0.663	−0.025
56.....	0.392	1.689	0.663	0.630	−0.033
55.....	0.357	1.791	0.640	0.599	−0.041

Mortality Table for males. Also shown in Table 3 are values of the function $(0.95)^{65-y}$, which very closely approximates the true values of $A(y)$. For practical purposes, therefore, we shall use the following approximation in the remaining discussion:

$$A(y) = (0.95)^{65-y}. \tag{53}$$

Using definition (53) and remembering that the integration limits for excess plans are proportional to the right-hand side of formula (7), we find that these limits must be discounted by 5 per cent (compounded) for every year by which the normal retirement age is less than age 65. For example, an excess final-pay plan with normal retirement age 62 would be limited to 26.2 per cent (0.857 × 30.6) as an excess percentage.

Offset plans, again, would not be affected by all this, because such plans with, say, normal retirement age 62 would presumably refer to the old-age benefit payable at age 62 (80 per cent of the full primary insurance amount) and therefore integrate directly without any necessity to reduce the amount of offset. But, if an offset plan had a normal retire-

ment age under age 62, it could not be permitted to apply the offset until the social security benefit actually commenced or became payable.

Incidentally, since the social security old-age benefit is reduced by 20 per cent for retirement at age 62, the replacement ratio from social security at age 62 is precisely 80 per cent of P, so a plan with $y = 62$ should not be required to satisfy an integration criterion any stricter than

$$\frac{\partial B}{\partial S} - \frac{B}{S} \leq 0.8S(1.06)^n\left(-\frac{\partial P}{\partial S}\right), \tag{54}$$

which is stricter than formula (51) because $A(62) > 0.8$ (see Table 3).

3. EARLY RETIREMENT

Once the normal retirement age and benefit formula are decided upon, the computation of "accrued benefit" must be stated explicitly by the plan in accordance with IRC section 411(b), which sets lower limits on the rate at which the normal retirement benefit can be credited. There are three alternative tests for proper accrual, however, and as many ways of satisfying them as can be imagined. Therefore, we shall be unable to write a standard formula for the accrued benefit as we did for the projected normal retirement benefit. The only general statement which can be made is that $AB_x \leq B$, where AB_x is the accrued benefit at age x and B is the normal retirement benefit, projected with the usual assumptions.

Generally, at early retirement an employee then aged x has the choice of (*a*) a deferred pension equal to AB, payable at normal retirement date, or (*b*) an immediate pension equal to $(AB)h(x)$, where $h(x)$ is the early retirement reduction factor. We shall now examine whether and to what extent the choice of $h(x)$ affects a plan's proper integration with social security.

a) The Extended Integration Criterion

The early retirement benefit itself is not intended to integrate directly with social security old-age benefits—early retirement is often allowed at ages well below 62—but we do not want the IC (5) to be circumvented by the early retirement provision. Let us therefore define a new R as the ratio of (*a*) the present value at age x of the early retirement pension and the (deferred) old-age benefit to (*b*) earnings at the time of early retirement:

$$R = \frac{h(x)(AB_x)N_x^{(12)}/D_x + (PIA)N_{65}^{(12)}/D_x}{S(1.06)^{n-(65-x)}}, \tag{55}$$

where n is the number of years from 1976 to age 65. Here the old-age benefit is valued as a nonincreasing life annuity because IRC section

401(a)(15) prohibits reductions in pension due to postretirement increases in social security, implying that integration of defined benefit plans should not take account of such increases.

An extended integration criterion (EIC) may now be set forth as follows:

$$\frac{\partial R}{\partial S} \leq 0 . \tag{56}$$

Note that formula (56) reduces to (5) when $x = 65$.

By substituting formula (3) in formula (55) and differentiating the result, we obtain from (56)

$$\frac{\partial R}{\partial S} = \frac{N_x^{(12)} h(x)}{S D_x (1.06)^{n-(65-x)}} \left[\frac{\partial (AB_x)}{\partial S} - \frac{AB_x}{S} \right] + \frac{N_{65}^{(12)} S(\partial P / \partial S)}{D_x (1.06)^{-(65-x)}} \leq 0 . \tag{57}$$

Thus

$$\frac{\partial (AB_x)}{\partial S} - \frac{AB_x}{S} \leq \frac{S(1.06)^n}{h(x)} \frac{N_{65}^{(12)}}{N_x^{(12)}} \left(- \frac{\partial P}{\partial S} \right) . \tag{58}$$

The employee will reach age x (early retirement) $m = n - (65 - x)$ years from now, so we can express formula (58) as

$$\frac{\partial (AB_x)}{\partial S} - \frac{AB_x}{S} \leq \frac{(1.06)^{65-x}}{h(x)} \frac{N_{65}^{(12)}}{N_x^{(12)}} S(1.06)^m \left(- \frac{\partial P}{\partial S} \right) . \tag{59}$$

Now, applying definition (52), we see that the ultimate expression of the EIC is

$$\frac{\partial (AB_x)}{\partial S} - \frac{AB_x}{S} \leq \frac{A(x)}{h(x)} S(1.06)^m \left(- \frac{\partial P}{\partial S} \right) , \tag{60}$$

of which formula (7) is just the special case $x = 65$.

b) Application of the Extended Criterion

We shall now examine the impact of the EIC (60) on the three standard defined benefit formulas of Section III, A, 2—in particular, to see how the definition of $h(x)$ affects the integration limits.

i) *Final-pay offset formula.*—The definition of accrued benefit for an offset plan is normally based on the "fractional rule" of IRC section 411(b)(1)(C). That is, it is based on (*a*) a ratio, t, of actual service at early retirement to potential service at normal retirement, applied to (*b*) the projected benefit at age 65 assuming constant earnings and no changes in social security:

$$AB_x = t[pS\ddot{a}_{\overline{k}|}/k - q(PIA')] . \tag{61}$$

Compare this with formula (10). Here PIA' refers to the primary insurance amount that would result if no further indexing of social security took place after early retirement; in other words,

$$PIA' = S(1.06)^m P . \tag{62}$$

Therefore,

$$AB_x = tS[p\,\ddot{a}_{\overline{k}|}/k - q(1.06)^m P] . \tag{63}$$

Now, if we apply the EIC (60) to formula (63), we obtain

$$\begin{aligned} \frac{\partial(AB_x)}{\partial S} - \frac{AB_x}{S} &= qtS(1.06)^m\left(-\frac{\partial P}{\partial S}\right) \\ &\leq \frac{A(x)}{h(x)} S(1.06)^m\left(-\frac{\partial P}{\partial S}\right), \end{aligned} \tag{64}$$

which means that

$$qt \leq A(x)/h(x) . \tag{65}$$

The most stringent limit on q is when $t = 1$:

$$q \leq A(x)/h(x) . \tag{66}$$

If, therefore, $h(x) > A(x)$, we cannot allow 100 per cent offset of the primary insurance amount but must limit q to the lowest possible ratio $A(x)/h(x)$. In other words, if the early retirement "discount" is less than 5 per cent per year compounded, the plan is considered to contain "subsidized" early retirement. Conversely, if $h(x) \leq A(x)$, the early retirement reduction is sufficient to preserve proper integration and the limit of 100 per cent need not be adjusted.

ii) *Final-pay excess formula.*—The accrued benefit under this type of formula would be required to satisfy either the 3 per cent rule—IRC section 411(b)(1)(A)—or the fractional rule—section 411(b)(1)(C). In either case, for some fraction t,

$$AB_x = tp(1.06)^m(S\ddot{a}_{\overline{k}|}/k - 15{,}300) , \tag{67}$$

which should be compared with equations (14)–(16). Applying the EIC (60) we find

$$\begin{aligned} \frac{\partial(AB_x)}{\partial S} - \frac{AB_x}{S} &= tp(1.06)^m \frac{15{,}300}{S} \\ &\leq \frac{A(x)}{h(x)} S(1.06)^m\left(-\frac{\partial P}{\partial S}\right), \end{aligned} \tag{68}$$

which (since $S > 15{,}300$) reduces to

$$tp \leq 15{,}300[A(x)/h(x)](2)(10^{-5}) , \tag{69}$$

or

$$p \leq 0.306A(x)/h(x) \tag{70}$$

in the worst case, $t = 1$. Thus, for this formula too, the integration limit must be reduced if $h(x) > A(x)$.

iii) *Career-pay excess formula.*—The accrued benefit m years hence, at early retirement, is simply

$$AB_x = AB + p(S - 15{,}300)s_{\overline{m}|0.06}\,, \tag{71}$$

where AB with no subscript is the present (1976) accrued benefit (cf. eqs. [20] and [22]). Thus the EIC (60) implies

$$\begin{aligned} \frac{\partial(AB_x)}{\partial S} - \frac{AB_x}{S} &= p\frac{15{,}300}{S}\, s_{\overline{m}|} + \frac{\partial(AB)}{\partial S} - \frac{AB}{S} \\ &\leq \frac{A(x)}{h(x)}\, S(1.06)^m\left(-\frac{\partial P}{\partial S}\right), \end{aligned} \tag{72}$$

which, if we assume as before that AB satisfies the EIC exactly for $m = 0$ and $S = 15{,}300$, is equivalent to

$$\begin{aligned} p\frac{15{,}300}{S}\, s_{\overline{m}|} + \frac{A(x)}{h(x)}(15{,}300)\left(-\frac{\partial P}{\partial S}\right) \\ \leq \frac{A(x)}{h(x)}\, S(1.06)^m\left(-\frac{\partial P}{\partial S}\right). \end{aligned} \tag{73}$$

In the worst case, $S = 15{,}300$, so formula (73) implies

$$p \leq 0.018A(x)/h(x)\,. \tag{74}$$

Therefore, here again, the standard limit must be reduced if $h(x) > A(x)$.

c) Summary

If the reduction (discount) for immediate early retirement is at least 5 per cent compounded for each year, the plan is properly integrated—provided, of course, that the normal retirement formula satisfies the basic integration rules. If the reduction is less than 5 per cent—that is, if early retirement is subsidized—the integration limits must be reduced by the lowest ratio of $A(x)/h(x)$, or $(0.95)^{65-x}/h(x)$. Note that under this rule the $\frac{5}{9}$ per cent reduction formula used for social security old-age benefits would not constitute subsidized early retirement, nor would "true" actuarial reductions based on any reasonable interest and mortality assumptions. Note also that total subsidy—that is, $h(x) = 1$—would require the same reduction as though the plan had a normal retirement age less than 65 (see Sec. IV, B, 2).

4. DEFINITION OF FINAL-AVERAGE PAY

In the theoretical development it was shown that the averaging period for defining final-average pay was immaterial to the satisfaction of the integration criterion. Nevertheless, this argument was based on a theoretical model, and in practice the IRS has felt obliged to place limits on the way in which final-average pay can be defined in both integrated and unintegrated pension plans (see Revenue Rulings 71-330 and 72-276)—requiring all final-pay plans to average over at least three consecutive years, so as to prevent manipulation of the plan by those in a position to control salaries. Such concerns on the part of the IRS are still valid, but there is no basis in the theory for requiring different integration limits for different averaging periods, provided that the minimum standards set for all final-pay plans—integrated and unintegrated—are met.

Note that ERISA has had some things to say about the definition of final-average pay, adding sections 411(a)(9) and 411(b)(1)(C) to the Code. The first section deals with the definition of normal retirement benefit, and the second, in effect, limits the averaging period to no more than ten years for computing the accrued benefit. The two sections taken together limit the averaging period to ten years, since the accrued benefit must approach the normal retirement benefit as the employee approaches his normal retirement date.

5. EMPLOYEE CONTRIBUTIONS

Since the integration criteria were developed with respect to benefits only, without regard to who pays for them, the presence or absence of employee contributions to the plan—whether mandatory or voluntary—can have no impact on discrimination and, consequently, on integration. Therefore, no adjustments to the integration limits are required for contributory plans.

6. VARIABLE OR COST-OF-LIVING PROVISIONS

Since social security old-age benefits themselves rise with increases in the CPI, no discrimination can result from allowing integrated private plans to do likewise. Therefore, no adjustment to the integration limits is called for in this case.

7. PRERETIREMENT DEATH BENEFITS

Section 1.401-1(b)(1)(i) of the Regulations notes that the purpose of a pension plan is primarily to provide retirement benefits, so a qualified plan may provide only "incidental" death benefits. If the death benefits under a plan are "incidental" to the retirement benefits, and the retirement benefits (if they are properly integrated) are by definition nondis-

criminatory, then the death benefits must also be nondiscriminatory. Therefore, no adjustment to normal integration limits is called for in the case of qualified preretirement death benefits.

The only excuse, it seems to me, for having any preretirement death benefits in a pension plan (the primary purpose of which, it will be recalled, is to provide retirement income) is that it preserves the employee's actual or perceived "equity" in the plan in case of untimely death. Therefore, I can see no compelling reason for including in a pension plan a preretirement death benefit greater in value than, say, the present value of the accrued benefit at the date of death—possibly as much as the net level premium reserve for the projected pension. Any greater amount would not, in my view, be "incidental" to the retirement benefit.

Nevertheless, the IRS, since the court decision in the case of *Raymond J. Moore* (1941) has ruled that a death benefit of as much as 100 times the projected monthly pension at retirement, or the reserve under a typical retirement income contract if greater, is "incidental" for purposes of tax qualification. If the plan is integrated, such a death benefit is capable of producing some very high amounts.

Perhaps the Service should define "incidental" differently for integrated plans than for unintegrated ones, but once the death benefit has been declared "incidental" to a nondiscriminatory retirement benefit, there can be no further claim that the death benefit is itself discriminatory.

8. NORMAL FORM OF PENSION

A glance at Section III, A, 1 will remind the reader that the development of the IC did not presuppose any particular form of pension, although it did contemplate at least a life income from the plan. Whatever the normal form, it may be thought of as a life annuity and a postretirement death benefit. The death benefit portion does not concern us, being presumably "incidental," while the life income portion must already satisfy the IC. Therefore, the normal form is immaterial to proper integration.

9. DISABILITY BENEFITS

Social security considers disability benefits to be a form of retirement pension rather than an incidental or ancillary benefit. It provides a disability pension equal to the full primary insurance amount, regardless of the age at disablement.

If the disability provision under a private plan simply allows continuing service credits during disability, or a benefit which is actuarially equivalent to the accrued retirement benefit, there is no possibility of

discrimination, since the benefit is truly incidental to the age-retirement benefit.

If, however, there is a disability pension which is based on the (integrated) retirement benefit formula, this pension must itself be considered a form of retirement benefit and must integrate with its counterpart under social security. Fortunately, the old-age and disability retirement pensions are equal under social security, so the function P (formula [3]) adequately represents the replacement ratios for disability benefits as well as old-age benefits. Consequently, since the private plan retirement benefit is presumed to be integrated properly, a disability pension under the plan will also be properly integrated, provided that it does not exceed the normal retirement benefit computed on the plan formula—that is, the "qualified disability benefit" of IRC section 411(a)(9). If length of employment were a factor in the benefit formula, it would not be discriminatory to credit a disabled employee with the service he missed on account of becoming disabled, because social security in effect does the same. Naturally, the definition of "disability" under the plan should be no less strict than that of social security if discrimination is to be avoided.

10. SUMMARY OF ADJUSTMENTS

We have seen that only two plan features require an adjustment to the integration limits per se: (*a*) a normal retirement age different from age 65 and (*b*) "subsidized" early retirement. We have, however, found it necessary to suggest some limits to the definitions of "final-average pay," "disability," and "incidental death benefits."

V. CONCLUSION: NEW INTEGRATION RULES

We are now in a position to gather all of the foregoing results into a comprehensive set of integration rules. All of the rules, let it be noted, stem directly from the integration theory, with only minor exceptions as detailed in Section IV, A.

A. *Defined Contribution Plans*

The contribution rate on earnings in excess of the "integration level" may be as high as 7.3 per cent. The integration level may not exceed the social security wage base in effect at the end of the plan year in which the contribution formula applies.

B. *Defined Benefit Plans*

1. BASIC LIMITATIONS

a) Offset Formula

The maximum offset at normal retirement date is 100 per cent of the social security primary insurance amount payable at that time, whether

the latter amount is computed on the current law or on some extinct law. If no old-age benefit is payable at normal retirement age, the application of the offset must be delayed until it is payable.

b) Excess Formula

The limitation depends on whether the formula is applied to career-average pay or to final-average pay.

i) *Final pay.*—The maximum benefit rate is 30.6 per cent of the excess of final pay (averaged over at least three consecutive years) over the integration level—which may not exceed the wage base in effect at the time the formula is applied.

ii) *Career pay.*—The maximum benefit rate is 1.8 per cent of the excess of current pay over the integration level—which may not exceed the wage base in effect at the end of the plan year.

2. ADJUSTMENTS TO BASIC LIMITATIONS

The basic limitations apply universally, except in the following situations.

a) Normal Retirement Age Greater than 65

If the plan uses an excess formula, the basic limitation may be increased by 1 per cent compounded for each year (up to seven) by which the normal retirement age is greater than 65.

b) Normal Retirement Age Less than 65

If the plan uses an excess formula, the basic limitation must be discounted by 5 per cent (compounded) for each year by which 65 exceeds the normal retirement age.

c) Subsidized Early Retirement

Regardless of the type of benefit formula, if for any age x the reduction factor $h(x)$ for immediate early retirement at that age is greater than $(0.95)^{y-x}$, the basic limitation must be multiplied by the minimum value of $(0.95)^{y-x}/h(x)$, where y is the normal retirement age.

3. OTHER RESTRICTIONS

a) Definition of Disability

If the disability benefit under the plan is a pension commencing (more or less) immediately upon disablement, in an amount computed on the normal retirement formula, the definition of "disability" must be at least as strict as that of social security.

b) Death Benefits

Any such benefits, whether pre- or postretirement, must be "incidental" to the retirement benefits provided under the plan, as that term may be defined by the IRS.

VI. POSTSCRIPT: TARGET PLANS

A. *General Remarks*

ERISA introduced for the first time a clear distinction between defined benefit and defined contribution plans. Some plans, however, contain features of both types, and these have been deliberately ignored in this paper; but I would like to make a few remarks about one of the more popular of such hybrids: the target plan.

The subject of tax qualification of target plans has always been difficult for the IRS. As long ago as November 30, 1972, Isidore Goodman (then chief of the Pension Trust Branch), in answer to a question, promised: "We expect to issue a Revenue Ruling on the subject. A fixed time cannot now be specified since various problems are still coming in." But the ruling never came. The framers of ERISA did not want to grapple even with a definition of "target benefit plan," leaving that up to the secretary of the Treasury or his delegate (IRC sec. 410(a)(2)(A)). We can be fairly sure of what a target plan is, however, because Congress, in *House Report No. 93-1280* (93d Cong., 2d sess., pp. 344, 345), said that it understands a target plan to be one in which the employer establishes a target pension but in which the actual pension is based on the amount actually in the participant's account. This means that a target plan is a defined contribution plan within the meaning of IRC section 414(i).

A target plan has a stated normal retirement date and a benefit formula for the amount of pension intended to be produced at that date. The contributions on behalf of each employee are (more or less) actuarially determined so as to produce the targeted amount; actual benefits, nevertheless, are limited to those which can be provided by the employee's account balance.

In the past, target plans have been highly susceptible to discriminatory manipulation. For example, the target benefit formula is only hypothetical, so some plans have reserved the right of the employer to contribute less than the indicated amount in years when he felt it desirable to do so. Thus an employer might contribute the necessary amounts to provide the targeted pension for certain key employees, but once they had retired he might arbitrarily reduce or discontinue contributions to the plan without penalty. The provisions required to be present in defined benefit plans to prevent discrimination in the event of early plan

termination or curtailment (IRS Mimeograph 5717) were not required for target plans. Also, the computations of contribution amounts for each employee were generally not subject to verification and were not required to be carried out by qualified persons.

Beginning in 1976, however, target plans, because they are defined contribution plans, are subject to the limitations on "additions" specified in IRC section 415(c)—25 per cent of pay or $25,000, whichever is less (the $25,000 limit being CPI-indexed). The maximum deductible amounts specified by IRC section 404, however, do not apply to target plans because they are money-purchase pension plans rather than profit-sharing plans.

The most significant change in the law with respect to target plans is that, as money-purchase pension plans, they are subject to the minimum funding standards of IRC section 412(a)—as is made clear by the Conference Committee report on ERISA: "Money purchase plans and other individual account plans generally are not excluded from the minimum funding rules." Therefore, beginning in 1976, target plans must retain an enrolled actuary on behalf of the participants, utilize reasonable actuarial methods and assumptions, make the required contributions to the fund each year, determine experience gains and losses and amortize them over their appropriate period, and get the approval of the IRS for any change in funding method (which in the case of target plans includes not only the actuarial method used to determine contributions but also the target benefit formula itself). Thus we may expect that many of the actual and potential abuses of target plans will be halted.

B. *Discrimination Test*

Although ERISA requires that target plans meet minimum funding standards and maximum contribution rules in order to be qualified under IRC section 401, there is still a question as to whether a target plan can be qualified within the meaning of section 401(a)(5), because neither the contributions nor the benefits necessarily bear a uniform relation to compensation. Any method of determining contributions under a target plan must take into account not only the employee's compensation but also his entry age and/or attained age, so that if the higher-paid employees are generally older, the rates of contribution for the "prohibited group" could easily be higher than those for rank-and-file employees.

It seems to me, however, that the target plan could be deemed to have met the requirements of section 401(a)(5) if, in general, there is no positive correlation between contribution *rates* and compensation rates. Therefore, I suggest the following test for qualification of a target plan—

a test which would apply in addition to the requirements of IRC sections 412 and 415: if r_i is the contribution rate on behalf of participant i and S_i is his rate of pay, then a target plan would be deemed to have met the requirement of uniformity of contribution rates if the *correlation coefficient* of the two "random variables" r_i and S_i is not positive. Mathematically, this may be expressed:

$$\frac{n \Sigma r_i S_i - (\Sigma r_i)(\Sigma S_i)}{\{[n \Sigma r_i^2 - (\Sigma r_i)^2][n \Sigma S_i^2 - (\Sigma S_i)^2]\}^{1/2}} \leq 0 , \qquad (75)$$

where n is the number of participants. Because the denominator is always positive, (75) is equivalent to

$$\Sigma r_i S_i / \Sigma S_i \leq \Sigma r_i / n . \qquad (76)$$

In words, the first requirement for qualification of a target plan—whether or not integrated with social security—would be that the *aggregate* contribution rate not exceed the *average* contribution rate. The application of this test is illustrated by the following two examples:

EXAMPLE 1

Consider a plan with four participants, A, B, C, and D, with salaries and contribution rates in accordance with the following table:

Employee	Salary	Contribution Rate	Contribution
A	$10,000	0.05	$ 500
B	10,000	0.11	1,100
C	30,000	0.06	1,800
D	30,000	0.07	2,100
Total	$80,000	0.29	$5,500

In this example the average contribution rate is 0.29/4 = 0.0725, and the aggregate contribution rate is 5,500/80,000 = 0.06875. The aggregate rate does not exceed the average rate, so the plan does not generally discriminate in favor of the higher-paid.

EXAMPLE 2

Employee	Salary	Contribution Rate	Contribution
A	$10,000	0.06	$ 600
B	10,000	0.09	900
C	30,000	0.06	1,800
D	30,000	0.11	3,300
Total	$80,000	0.32	$6,600

In this example the average rate is $0.32/4 = 0.08$, while the aggregate rate is $6{,}600/80{,}000 = 0.0825$, so the plan would not qualify because the aggregate rate exceeds the average rate, and we infer that the contribution rates are generally higher for the higher-paid.

C. *Integration of Target Plans*

Unlike "normal" defined contribution plans, target plans would integrate with social security by having a target benefit formula which was integrated. When we discussed integration rules for defined contribution plans generally, we noted that any limits should apply to the contribution formula rather than to the ultimate amount of benefit, in order to avoid limiting the investment income which could be earned on the fund. But in the case of target plans, the contribution formula is governed by the target benefit formula, and contributions must be adjusted to take into account experience gains and losses, including investment gains (IRC sec. 412). Therefore, the integration rules for target plans should apply to the target benefit formula itself. The limits would be the same as those for defined benefit plans.

D. *Summary*

Adverse discrimination in target plans could be prevented by the cumulative effect of (1) the requirement that the "discrimination test" described above—that is, that the aggregate contribution rate not exceed the average contribution rate—be met by the plan each year; (2) the funding standards of IRC section 412(a), including the supervision of an enrolled actuary and the use of reasonable actuarial assumptions; (3) the contribution limits of IRC section 415; and (4) application of integration limits for defined benefit plans to the target benefit formula.

DISCUSSION OF PRECEDING PAPER

BARNET N. BERIN:

As an advocate of radical surgery of the integration rules,[1] I found Mr. Anderson's paper most interesting and most stimulating. Taking nothing away from a fine effort, I wish that he had gone further and explored the "cap."

The cap is the maximum benefit applicable at retirement. The pension plan benefit is reduced if the pension plan benefit plus the primary social security benefit is too high in relation to final average salary. Typically, the test compares the pension plan benefit plus the primary social security benefit with 85 per cent of final average salary. If the combination is higher than 85 per cent, the pension plan benefit is reduced.

In theory, the test is sensible, because after retirement the person receives both the pension plan benefit and a primary social security benefit. More work should be done, however, to assess the 85 per cent as it relates to retirement needs. We do know that income needs generally decrease after retirement, for several reasons:

1. Social security is free from all income tax (federal, state, and city).
2. Social security benefits are indexed, permitting increases but not decreases.
3. Job-related expenses are eliminated.
4. There are double personal income tax exemptions for persons over age 65.
5. A lower overall tax bracket is effective after retirement.

Perhaps the percentage for the lowest-paid employee should be higher than the percentage for the highest-paid employee. Some grading might be desirable, from, say, 100 per cent for lower-paid employees to 75 per cent or lower for the highest-paid employees. In the absence of some grading, the cap may affect principally the low-paid, long-service employees.

In collective bargaining during 1974–75, the cap was inserted in several major settlements in the aluminum, steel, and copper industries. Since then a small number of salaried plans and hourly plans have adopted this form of maximum benefit. Philosophically, it is interesting to find the cap in both salaried and hourly pension plans. Over the years, hourly wage distributions have become less concentrated and show a greater range from low to high salary. With the cap used in both types of plans, salaried

[1] *Proceedings of the Conference of Actuaries in Public Practice*, XXIV (1974–75), 402.

and hourly pension plans have been drawn closer together. This could be useful, since it may become less feasible in the future to have one pension formula for salaried employees and a different pension formula for hourly employees.

However, there is a basic technical problem with the cap. The concept does not meet satisfactorily the IRS tests for coordinating pension plan benefits with social security. Revenue Ruling 71-446 requires plans to coordinate with a maximum of 83⅓ per cent of the primary social security benefit. The cap blithely coordinates with 100 per cent of the primary social security benefit.

Regardless of how the IRS rules, some form of cap seems worth considering. Assuming that social security benefits will increase, the cap could sensibly control pension costs in the future. The cap gives the employer a bargaining point that he previously did not have. In order to be effective, however, it must be acceptable to both sides. In collective bargaining, the employer can take the position that the cap is both appropriate and necessary. Social security benefits and contributions can only increase. The company does not have unlimited dollars to spend on employee benefit programs. This position is reinforced if the cap applies to both salaried and hourly pension plans. It should be apparent that it is not productive, socially desirable, or necessary for a company to offer a combined retirement income, as defined in the cap, that exceeds the employee's preretirement salary. Both company and union have a common interest in avoiding excessive pension spending that would be detrimental to other elements of the benefits or compensation structure. A well-designed cap presented as a careful part of collective bargaining strategy should have little immediate effect on cost or benefits. The effect should become more widespread in the future, however.

If acceptable to employers, unions, and the IRS, the use of the cap could avoid the problems of satisfying the IRS integration requirements. To many, Revenue Ruling 71-446 is an awesome document that is very complex, and therefore is to be avoided by designing simplistic plans or by removing any connection with social security. If the cap is generally accepted, the complex rules will no longer be so important. The employer who wants to use a straight 1½ or 2 per cent pension formula can avoid generating excessive benefits at retirement by installing the cap. Since the cap is based on final pay, it probably is of limited value in a well-designed final-pay social security offset pension plan.

I hope that Mr. Anderson's paper is read widely, particularly since it could very well lead to simplification and a commonsense approach to the difficult problem of coping with Revenue Ruling 71-446.

CECIL J. NESBITT:

In this brief discussion, I want to acknowledge the contribution the author has made to clarifying the perplexing problem of how to integrate dynamic social security benefits with pension plan benefits that are based on principles and dynamics which differ from those underlying social security. He has indicated how mathematical and actuarial analysis can lead to rational solutions of the problem, and, while I think that many aspects of the problem are unresolved, he has provided us with tools for exploring solutions.

In his paper "Adjustment of Private Pension and Insurance Plans in the United States of America to Social Security—and to Inflation," presented to the recent Twentieth International Congress of Actuaries in Tokyo, C. L. Trowbridge describes problems related to the various integration mechanisms (offset, excess, and step-rate). In particular, he notes the unpalatable effect of offsetting the full primary insurance amount (PIA), which employees will regard as partially provided by their half of social security taxes. The author's analysis can be generalized to recognize this situation, but, of course, if this is done, the integration limits will be altered. Another problem for offset plans concerns how to take account of periods of service less than full careers with a single employer.

Of necessity, there is much discussion of redefining social security benefits (see, for example, Francisco Bayo's review of the *Report of the Consultant Panel on Social Security* in *The Actuary*, September, 1976). The panel proposes that the PIA formula for a given average price-indexed monthly earnings (APIME) be 80 per cent of the first $200 of APIME, plus 35 per cent of the next $400 of APIME, plus 25 per cent of the APIME over $600, with the bend points to be adjusted annually to changes in the CPI. If for the future the PIA is so defined (or is defined on analogous lines using some index other than price index), then it should be simpler to define rational integration procedures. For example, plan benefits might exclude the first level of APIME and provide moderate unit benefits based on final average compensation in excess of the first bend point for the APIME.

Again, my thanks to the author for his lucid and stimulating paper on a major problem of pension plan design.

(AUTHOR'S REVIEW OF DISCUSSION)

ARTHUR W. ANDERSON:

Messrs. Berin and Nesbitt have, coincidentally, addressed the two main facets of the question of integration, one being political reality and

the other practicality. Mr. Berin introduces us to the concept of the maximum benefit formula with a 100 per cent offset as a desperate attempt by employers to compensate for social security benefits that have caused unintegrated pension formulas to produce, in some cases, more income for an employee than he was earning before retirement. Of course, if one is to accept the "cap" as a legitimate integration tool, then he must automatically accept integration of 100 per cent of the social security benefit. (Otherwise, one could effectively integrate 100 per cent of social security by designing a primary benefit formula so high that the cap formula would always apply.)

Mr. Nesbitt raises the question of whether it will ever be politically acceptable to allow 100 per cent offset plans. I do not think there is too much of a problem in this respect immediately, since we are already allowed $83\frac{1}{3}$ per cent offset and it is not a great leap from that to 100 per cent. After all, it is not the obligation of any employer to offer any private plan whatsoever. Therefore, if he decides to use his money first to even out the total replacement ratio (from both plan and social security) for all employees, before increasing benefits for the lower-paid, it seems entirely reasonable for him to be allowed to do so. Whether or not it is reasonable, it is clearly permitted by sections 401(a)(4) and 401(a)(5) of the Internal Revenue Code.

In fairness to the IRS, I must direct the reader's attention to the fact that, after the paper was written, the Service issued a revenue ruling on target plans. The ruling, I am sorry to say, did not make use of my ideas.

The primary thesis of the paper, which is that discrimination should be measured by the amount of pension rather than by the present value of the pension, has been reinforced by two facts that were not noted in the paper. The first is that the new section 415 of the Code provides that, in computing the maximum benefit limitation, the normal form of the pension may be disregarded if it is "qualified joint and survivor." The section does provide for actuarial adjustments in the case of other normal forms, but there is this significant exception. The second fact is that the IRS has decreed that the presence of a qualified joint and survivor preretirement death benefit may be ignored when applicable integration limits are computed, even though Revenue Ruling 71-446 would require it to be taken into account. It is my conviction that significant discrimination does not arise from ancillary death benefits or forms of annuity but is usually found in the amount of pension itself.

Mr. Berin's discussion brings to mind the observation that my function P (eq. [3]) is equally as useful in benefit planning as in the development of integration theory. In particular, if one considers, say, an unintegrated

pension plan providing $1\frac{1}{2}$ per cent of final pay for each year of service, subject to a cap formula of 85 per cent of final pay less 100 per cent of the PIA, the combined effect of these formulas could be analyzed in terms of the total replacement ratio. This could be done by setting up a formula for the plan benefit similar to that of equation (14), dividing it by an expression for final pay similar to equation (9), and adding the function P. One would find that such a plan provided total replacement ratios that were exactly 85 per cent up to some salary level and then tapered off rather rapidly to a lower limit as salary increased. This pattern of replacement ratios is not ideal, although I can sympathize with the desire to use the cap approach on an existing pension formula that cannot be changed. A better pattern of replacement ratios would be found from, say, a 50 per cent offset plan, because the sharp discontinuity in the middle range of salaries would be avoided (replacement ratios would grade smoothly from about 80 per cent down to 50 per cent for very high salaries). The use of the total replacement ratio in planning is effective because it draws attention away from the details of the plan formula and directs it toward the relative amount of an employee's retirement income.

With respect to Professor Nesbitt's mention of the problem of short careers under offset plans, I can understand the concern about equity under such situations, but I believe that the subject of integration has to do with discrimination rather than equity. For example, a plan formula might not be equitable for a certain class of employees—say those with short service—but as long as it does not discriminate in favor of the prohibited group, there is nothing I can see in the Code to prohibit it.

This brings me to my final remark concerning integration, which is that I hope that a dialogue has been opened on the subject, and that the dialogue will take place within a logical framework. The purpose of IRS integration rules is not to correct all wrongs but rather to implement the antidiscrimination language of the Code. The place for politics and ideology is in the enactment of the Code itself, not in the development of coherent regulations to implement the Code.

I thank Messrs. Berin and Nesbitt for their discussions, and I hope they will be joined by many other actuaries and other interested persons who will speak out on this important issue.