

**M**ethodology involved in  
Developing Long-Range  
Cost Estimates for the  
Old-Age, Survivors, and  
Disability Insurance System

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This study has been prepared by the Division of the Actuary under authority delegated by the Commissioner of Social Security. It is designed for use of the Staff and for limited circulation to other persons in administration, insurance and research concerned with the subject treated.

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METHODOLOGY INVOLVED IN DEVELOPING LONG-RANGE COST ESTIMATES  
FOR THE OLD-AGE, SURVIVORS, AND DISABILITY INSURANCE SYSTEM

A. Introduction

The Advisory Council on Social Security Financing, appointed in accordance with the provisions of the Social Security Amendments of 1956, issued a report entitled "Financing Old-Age, Survivors, and Disability Insurance," dated January 1, 1959.<sup>1/</sup> The major finding of this Council was as follows:

"The method of financing the old-age, survivors, and disability insurance program is sound, and based on the best estimates available, the contribution schedule now in the law makes adequate provision for meeting both short-range and long-range costs."

In connection with its studies of the cost estimates, the Council expressed its belief "that the assumptions are a reasonable basis for forecasts extending into the distant future, and that the estimating techniques are appropriate and sound." It endorsed "the present practice under which both the estimating techniques and the assumptions are re-examined periodically to take account of emerging experience and changing conditions."

The Council's studies of the cost estimates were delegated to its subcommittee on Actuarial Cost Estimates, whose unpublished report made a number of recommendations. One of these was as follows:

"We also recommend that the Actuary adopt the practice of assembling in a single report a detailed description of the technique used in making cost estimates, the actuarial formulas and factors used and their bases or derivation and the actual calculations. Such report would be a public document available to any one for reference or study purposes. It would also simplify the work of future Advisory Councils."

It is the purpose of this Actuarial Study to fulfill this recommendation in regard to the long-range cost estimates for the Old-Age, Survivors, and Disability Insurance system under the provisions in effect following the 1956 Amendments, as well as to furnish a brief description of the modification of these methods and calculations used to prepare the cost estimates for the 1958 Amendments at the time of legislative

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<sup>1/</sup> Nineteenth Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance Trust Fund and the Federal Disability Insurance Trust Fund (House Doc. No. 181, 86th Cong.), Appendix IV.

activity. The detailed actuarial cost estimates for the program as it is following the enactment of the 1958 Amendments, along with a brief summary of the assumptions used, will be contained in a subsequent Actuarial Study; summarized cost estimates therefor are contained in the 19th Trustees Report.<sup>2/</sup>

The current methodology differs in only a few respects from that followed in the cost estimates presented in Actuarial Study No. 48, the ones reviewed by the Advisory Council on Social Security Financing but rendered out of date by the Social Security Amendments of 1958. The original cost estimates for these amendments<sup>3/</sup> were prepared by appropriate modifications of the cost estimates for the system as it existed following the 1956 Amendments, to incorporate the changes made in 1958.

Closely related to the question of the methodology involved in the preparation of long-range actuarial cost estimates for the OASDI system are two other subjects that the Subcommittee on Actuarial Cost Estimates of the Advisory Council on Social Security Financing studied and discussed in its report. The first was a review of the principles underlying the financing of the OASDI program as they have developed. The second was a statement of the basic procedures used in reviewing the contribution schedule when the basic experience factors change or when there may be amendatory action. Discussions of these two matters are presented in Appendices I and II, respectively, which are adaptations from the Subcommittee Report with certain portions somewhat expanded.

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<sup>2/</sup> Ibid, pp. 26-30, 35-41.

<sup>3/</sup> "Actuarial Cost Estimates and Summary of Provisions of the Old-Age, Survivors, and Disability Insurance System as Modified by the Social Security Amendments of 1958," prepared for the use of the Committee on Ways and Means by Robert J. Myers, September 2, 1958.

## B. The Projection Basis of the Cost Estimates

Two methods of presenting actuarial valuations of social insurance programs and private pension plans are in common use. The one most frequently used in the past is the "balance sheet" method, which to some extent follows standard accounting procedures. This involves setting up the assets and liabilities, both actual and potential (either on a "closed group" basis for the existing covered individuals, or on an "open end" basis including all future entrants) as of a given date. Under one approach, the future assets are valued in accordance with the actual scheduled contribution rates, and the resulting deficit or surplus (in monetary units or as related to payroll) is derived. Under another approach, the assets and liabilities are "balanced" by determining the contribution rate needed to achieve this result.

The other valuation procedure, the "projection" method, involves the development year-by-year into the future (perhaps at quinquennial or decennial intervals) of all such elements as covered workers, beneficiaries, contribution income, interest income, benefit disbursements, administrative expenses, covered payroll, and growth of the fund.

The main advantage of the "balance sheet" method is its ease of preparation since in most cases it follows well-established actuarial techniques, permitting the use of existing tables and computational short-cuts. This is particularly important when dealing with small systems, for which extensive work is not warranted. These remarks, however, apply only when "static" assumptions are made as to the various cost factors. If "dynamic" assumptions such as continuously improving mortality are used, the "projection" method might well prove to be less difficult to follow.

Another advantage sometimes claimed for the "balance sheet" method is that the making of assumptions for experience extending many years into the future is not required. Actually this is not so since under either method the costs are figured into perpetuity because of the assumption of continuing groups of new entrants). In fact, the "balance sheet" method may be even less realistic because it usually assumes static future conditions as to new entrants, mortality rates, retirement rates, etc.

Most laymen look upon valuations of the "balance sheet" type with complete mystification, and perhaps even skepticism. Often, comments are made that the figures quoted from such valuations are "only actuarial costs and do not represent real costs." This probably occurs because such cost figures of over-all benefit disbursements are so much higher than the current level. If the "projection" method is used, such criticism is greatly lessened. The immediate situation is clearly recognized, and this makes creditable and understandable the graphic picture presented of the program in the more distant future.

The argument is often made in favor of the "balance sheet" method, as against the "projection" method, that the former must be used when there is a lack or sparsity of experience data. Under such circumstances, the actuary is often forced to use previously prepared tables and rates from the experience of other systems or other countries. This argument is not valid. The "projection" method can be used--with sufficient ingenuity on the part of the actuary--under almost any circumstances where a "balance sheet" valuation is possible.

Long-range actuarial cost estimates and valuations, regardless of how developed or how presented, cannot be precise no matter how accurately and meticulously they may be prepared. Differences will inevitably arise between actual experience over the long-range future and the assumptions--even when the estimates are made by informed and technically competent actuaries. Although it cannot be expected that the figures will be precise, estimates must be made to indicate future trends in costs.

Because of the variations between actual experience and actuarial assumptions, it can well be argued that any cost estimates or valuations can best serve their purpose if they are presented on a range basis. This procedure has definite value although it does entail additional work. Because of limitations of time, personnel, and money, it is not always possible. Even where the "range" procedure is followed, a single intermediate estimate may be required; it will not necessarily be more accurate or "probable" than either of the "range" estimates. Such a single estimate may, however, be needed for establishing long-range contribution rates required by the financing philosophy incorporated in the legislation.

In conjunction with cost estimates based on the "projection" basis, it is possible to develop "level-premium" figures, both for benefit and administrative costs and for contribution income. The "level-premium cost" is the percent of covered payroll that, if charged from the present indefinitely into the future, would produce sufficient contribution and interest income to the fund to meet the cost of the benefit payments and administrative expenses. The "level-premium equivalent of the contribution rates" is the percent of covered payroll that, if charged from the present indefinitely into the future, would produce the same amount of income to the fund over the long-range as will be produced by the graded schedule of contribution rates. The use of these two figures, taking into account the interest on the existing fund at the time of the valuation, gives an indication of the long-range actuarial balance of the system.

In large part based on the foregoing reasoning, the actuarial cost estimates for the OASDI system developed for the past quarter century have been of the projection type and--except for the original estimates for the 1935 Act--also of the range type.



The estimates based on the system under the provisions of the 1956 Amendments are discussed in detail in the succeeding sections. As a basis for that discussion, there follows a list of the principal quantities which were estimated for future years and used in deriving final costs:

1. Total population in all geographic areas covered by OASDI, by age groups and sex, for 5-year time intervals.
2. OASDI covered workers as proportion of total population.
3. Number of covered workers, derived from items 1 and 2.
4. Proportions of covered workers with 4 quarters of coverage in a year.
5. Average annual creditable earnings of covered workers, by coverage classification and by sex.
6. Total annual creditable earnings of covered workers, derived from items 3, 4 and 5.
7. Effective annual taxable payrolls, from item 6 adjusted for tax lags, employer tax on amounts in excess of individual wage maximum, and self-employment tax rate differential as compared with rate for employer and employee combined.
8. Annual tax receipts, from combined employer-employee tax rates applied to item 7.
9. OASDI insured population (potentially eligible for retirement or survivor benefits) as proportion of total population.
10. Insured population, derived from items 1 and 9. Female insured population subclassified as "steady" workers (retirement age 65 or over) and "nonsteady" workers (retirement at age 62 on actuarially reduced benefit).
11. Number of old-age beneficiaries in current payment status, from insured population over retirement age (item 10), reduced to allow for effect of retirement test.
12. Number of wife beneficiaries, from male old-age beneficiaries (item 11), multiplied by proportions married. Number is reduced for wives already included in item 11, then increased for wives receiving residual wife's benefit in addition to old-age benefit.
13. Deaths of insured male workers, from mortality rates applied to item 10.

14. Number of widows aged 62 and over, from item 13 by applying proportions of deceased insured male workers leaving widows, and using rates of termination due to mortality and remarriage. Number is adjusted in same manner as item 12 for widows entitled to old-age benefits.
15. Number of children of old-age beneficiaries, from number of old-age beneficiaries (item 11), applying factors based on past experience.
16. Number of survivor children of insured workers, from total child population (item 1), applying factors representing number of orphans of insured workers as proportion of total child population.
17. Number of mothers of child survivor beneficiaries, from number of survivor children (item 16), applying factors based on past experience.
18. Number of survivor parents, based on factors representing number of eligible parents as proportion of total aged ineligible population.
19. Number of lump-sum death payments, from mortality factors applied to insured population (item 10).
20. Disability incidence rates.
21. Number of disability beneficiaries, developed from incidence rates (item 20) applied to insured population (item 10), after adjustment for the more restrictive "disability insured status" requirements, using assumed rates of termination due to death, recovery, and attainment of age 65.
22. Number of dependents of disability beneficiaries, developed from projections similar to those listed for dependents of old-age beneficiaries (items 12 and 15).
23. Average primary insurance amounts in current payment status, projected from current averages to ultimate averages, based on items 4 and 5.
24. Annual amounts of benefits, from appropriate proportions of average primary insurance amounts (item 23) applied to numbers of beneficiaries (items 11, 12, 14, 15, 16, 17, 18, 19, 21, and 22). Proportions based on applicable fraction of primary insurance amount, with adjustments for effects of family maximum provisions, actuarial reductions in benefits, and residual benefit payments.

### C. Population Base

Underlying the entire long-range cost estimates for the OASDI system is a projection into the future of the entire United States population by age groups and sex. This is basic since the program covers about 90% of the total labor force in the country, and because of the benefits for dependents and survivors, the system applies to about this proportion of the entire populace. Such population projections must be carried far into the future because even under stationary demographic conditions the OASDI program would take many years to reach a stage of even relative maturity.

Accordingly, long-range population projections have been prepared, with figures being available for quinquennial periods to the year 2050. Actually, six population projections were prepared for various combinations of fertility and mortality assumptions. All projections apply not only to the 50 States, but also to other areas covered by the OASDI system. Only two of the six population projections are used for the purposes of the long-range OASDI cost estimates; one assumes low fertility and low mortality and the other assumes high fertility and high mortality. The assumptions for the former, because they produce a relatively high relationship between the aged and productive populations, result in the higher total cost for the OASDI system.<sup>4/</sup>

Extensive details about the assumptions and methodology of the population projections used as a base for the OASDI cost estimates are contained in Actuarial Study No. 46.

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<sup>4/</sup> The OASDI program provides monthly old-age benefits (including those to aged survivors) and monthly benefits for totally and permanently disabled insured workers aged 50-64 and for surviving orphans and their widowed mothers, plus lump-sum payments for deaths. The cost for the old-age monthly benefits predominates. Thus, other things being equal, estimates based on low-mortality assumptions, which yield relatively more aged persons, will show a higher total cost, since the larger cost for benefits to the aged will far more than offset the lower cost for young survivor benefits.

#### D. Earnings Assumptions

The estimates are based on level-earnings assumptions. This, however, does not mean that covered payrolls are assumed to be the same each year; rather, they rise steadily as the population at the working ages is estimated to increase. If in the future the earnings level should be considerably above that which now prevails, and if the benefits for those on the roll are at some time adjusted upward so that the annual costs relative to payroll remain the same as now estimated for the present system, then the increased dollar outgo resulting will offset the increased dollar income. This is an important reason for considering costs relative to payroll rather than in dollars.

Thus, the cost estimates have not taken into account the possibility of a rise in earnings levels, although such a rise has characterized the past history of this country. If such an assumption were used in the cost estimates--along with the unlikely assumption that the benefits, nevertheless, would not be changed--the cost relative to payroll would, of course, be lower. If benefits are adjusted to keep pace with rising earnings trends, the year-by-year costs as a percentage of payroll would be unaffected. In such case, however, the level-premium cost would be higher since, under such circumstances, the relative importance of the interest receipts of the trust funds would gradually diminish with the passage of time. If earnings do consistently rise, thorough consideration would need to be given to the financing basis of the system because the interest receipts of the trust funds will not meet as large a proportion of the benefit costs as anticipated.

Since earnings assumptions are used in determining both taxable income and benefit outgo, the following discussion will present the basis of making these assumptions. Subsequent sections contain the assumptions and methodology used in determining contribution income, benefit outgo, and other cost elements.

The 1956 earnings level is assumed to continue indefinitely for both the low-cost and high-cost estimates. More precisely, it is assumed that average annual credited earnings remain at the 1956 level (after adjustment for the earnings of the employment categories covered for the first time in 1957) for each of the following four categories: male 4-quarter workers; male workers with less than 4 quarters of coverage in a given year; female 4-quarter workers; and female workers with less than 4 quarters of coverage. All covered self-employed workers are considered as 4-quarter workers since they are always credited with 4 quarters of coverage.

The assumed percentages of 4-quarter workers vary by age and sex, but not by calendar year in the future. Actual percentages were available for 1954. They were increased somewhat because (1) railroad and military coverage had not been included in the 1954 data, (2) the increased coverage of the 1954 and 1956 Amendments decreased the in-and-out movement between covered and noncovered employment, and (3) much of the new coverage was in respect to the self-employed who are all regarded as 4-quarter workers. Such percentages are shown in Table 1, together with the average annual credited earnings for all workers at each attained age computed therefrom. The variation by age in average earnings is caused solely by the varying proportion of 4-quarter workers.

The relatively small variation in earnings by age within each of these groups was ignored. The extent of variation is illustrated by the following 1954 data for 4-quarter wage and salary workers (rounded to the nearest \$50). For men, the average was \$3100 for all ages combined and was \$2700 for ages 20-24, between \$3150 and \$3250 for each group from ages 25-29 to 55-59, \$3050 for ages 60-64, \$2850 for ages 65-69, and \$2400 for ages 70 and over. For women, the average was \$2150 for all ages combined and was between \$2200 and \$2300 for each group from ages 20-24 to 50-54, \$2150 for ages 55-59, \$2000 for ages 60-64, \$1750 for ages 65-69, and \$1600 for ages 70 and over.

For each of the four groups, the 1955 average credited earnings (i.e., excluding amounts in excess of \$4200) was obtained. Some estimating was necessary since the 1955 data available at the time the cost estimates were made were preliminary and did not provide the complete breakdown into the four groups. Using the very limited data available for 1956, the 1955 figures were increased somewhat to give the following estimates for 1956:

<u>Category</u>	<u>Men</u>	<u>Women</u>
4-quarter workers	\$3420	\$2430
1, 2, and 3-quarter workers	970	620

Preliminary data later received for 1956 show averages of \$3400 for male 4-quarter workers and \$2300 for females; these are based on persons directly covered in the year and do not include railroad workers and the armed forces. Apparently, the male figure used in the cost estimates is reasonably in line, and the female one is slightly high, but on the whole, the assumptions made initially seem satisfactory.

Table 1

PROPORTION OF COVERED WORKERS WITH 4 QUARTERS OF COVERAGE AND AVERAGE  
ANNUAL CREDITED EARNINGS OF COVERED WORKERS, BY AGE AND SEX

Age	Males		Females	
	Proportion with 4 Quarters of Coverage	Average Earnings	Proportion with 4 Quarters of Coverage	Average Earnings
15-19	39%	\$1,926	32%	\$1,199
20-24	72	2,734	54	1,597
25-29	85	3,052	56	1,634
30-34	88	3,126	60	1,706
35-39	89	3,150	64	1,778
40-44	89	3,150	70	1,887
45-49	89	3,150	74	1,959
50-54	89	3,150	77	2,014
55-59	87	3,102	77	2,014
60-64	83	3,004	77	2,014
65-69	73	2,758	71	1,905
70-74	70	2,685	66	1,815
75 and Over	70	2,685	61	1,724

## E. Contribution Income

Contribution income is estimated by applying the appropriate tax rate to the aggregate effective taxable payroll. The latter is defined so that the contribution income in the year is produced when the combined employer-employee tax rate is applied to it (a special modified procedure must be used for years when the rate changes). Under this concept, the earnings of the self-employed persons are adjusted downward to reflect the fact that they pay only 75% of the combined employer-employee rate.

In order to derive aggregate effective taxable payroll, there must first be obtained the total creditable payroll (creditable toward benefits) for all covered individuals. This is adjusted for the lower tax rate applicable to self-employed persons, to convert creditable payroll for employees to taxable payroll, and for the lag between the time the covered earnings are derived and the time the taxes are paid into the Trust Funds. Creditable payroll is obtained from the number of covered persons in each future year (by age and sex) and average covered earnings.

The coverage figures used are not the persons in covered employment on a given date, but rather the number of workers with any covered employment at all during a given year divided by the mid-year population. Assumptions as to the magnitude of the ratio were made by 5-year age groups and sex for every future quinquennial year.

First, "actual" figures for 1955 were estimated. Since only preliminary estimates of the number of covered workers in 1955, without complete age distribution, were available, and since it was necessary to increase such figures to allow for railroad and military coverage, the 1955 figures may be somewhat in error, especially for males. Then, estimates were made of the percentages that would have been covered in 1955 under the provisions of the 1956 Amendments (bringing in most "professional" self-employed groups and the uniformed services on a regular contributory basis) and with the full effect of the 1954 Amendments assuming that most State and local government units would elect coverage. The actual and modified 1955 figures are shown in Table 2.

Using the modified 1955 figures as a starting point, the percentages in future years were estimated. A continuation of close to full employment is assumed. For males, the percentages were assumed to remain the same at most ages in both the low-cost and high-cost estimates, but at the oldest ages considerable variation seems possible, with a low percentage producing a high cost since under this assumption fewer aged persons would have benefits suspended as a result of the retirement test. A decrease in the covered labor force participation rate was thus assumed at ages 65 and over for the high-cost

Table 2

COVERED POPULATION AS PERCENTAGE OF TOTAL POPULATION<sup>a/</sup>

Age	Male			Females		
	1955		2000 and After	1955		2000 and After
	On 1954 Coverage Basis <sup>b/</sup>	On 1956 Coverage Basis <sup>c/</sup>		On 1954 Coverage Basis <sup>b/</sup>	On 1956 Coverage Basis <sup>c/</sup>	
15-19	68	69	69-65	45	48	50
20-24	88	90	90	55	58	60
25-29	92	94	94	40	43	45
30-34	92	94	94	38	41	43
35-39	91	94	94	39	42	45
40-44	89	92	92	40	43	54
45-49	86	91	91	41	44	56
50-54	82	87	87	38	41	53
55-59	78	81	81	30	33	40
60-64	71	74	76-74	24	27	29-26
65-69	57	57	62-46	15	17	21-15
70-74	31	32	35-26	9	9	11- 8
75 and Over	12	12	13-10	2	3	3

a/ When two figures are shown, the first figure is the low-cost estimate and the second figure is the high-cost estimate. When only one figure is shown, the low-cost and high-cost estimates are the same.

b/ Estimates of actual 1955 figures including railroad workers and armed forces.

c/ Assumed 1955 figures with additional coverage of 1956 Amendments and full potential coverage of 1954 Amendments.



estimate, and an increase was assumed for the low-cost estimate. The percentage for males aged 15-19 for the high-cost estimate, not an important group from a cost standpoint, shows a slightly decreasing trend for the high-cost estimate--to reflect possible greater school attendance rates.

For females, a continuation of the recent trend of labor force participation rates was assumed. There is a slight increase at the young ages and a considerable increase at ages 40-59. The assumptions for women were the same up to age 60 in both estimates. At the older ages there is a slight increase for the low-cost estimate and a slight decrease for the high-cost estimate. Table 2 shows the assumptions for the year 2000, after which there is no change. Between 1955 and 2000, if there is a change at all, the figures are graded.

The total covered population for each calendar year is obtained quite simply, for the low-cost estimate and the high-cost estimate separately, by multiplying the estimated coverage percentage by the appropriate figure for the total population for each age-sex category. There is thus available for future years (actually, each fifth future year) the number of covered persons by quinquennial age groups, for men and women separately. From this, the aggregate creditable payroll (wages and self-employment income combined) is derived by multiplying the covered population in each age-sex cell by the appropriate average annual covered earnings (shown in Table 1) and totalling the results.

For wage and salary workers, taxable payroll is the aggregate amount of wages and salaries on which employers are taxed. Creditable payroll for this category is the aggregate amount of wages and salaries which are credited to individuals' accounts for use in computing average monthly wage when a claim is made. It might be thought that such taxable payroll and creditable payroll are the same. However, this is not the case because an employee who is taxed during a calendar year on more than the maximum earnings base of \$4200 (by reason of having more than one employer during the year) is nevertheless credited with only \$4200 for the year on his social security account. The contributions the employee has paid on earnings in excess of \$4200 are refundable, but since the matching contributions paid by the employers are not refundable, such earnings over \$4200 are part of the taxable payroll.

No such problem arises in connection with the self-employed, since the self-employment tax is paid in conjunction with the income tax after the close of the year. Consequently, the self-employed person does not pay the tax on any self-employment earnings which would make his total credited earnings (including any wages and salaries) for the year exceed \$4200.

The effective taxable payroll for a given calendar year is obtained from the total credited payroll on the basis of the following assumptions: (1) annual taxable payroll in respect to wage and salary workers is 1.024 times their credited payroll, but since the covered individual in effect pays contributions on only his credited earnings, this factor is reduced to 1.012; (2) credited payroll of self-employed persons is 12% of total credited payroll in the year; (3) for wage and salary workers, the taxes on 11/12 of their payroll for a year are appropriated in the same year, with the remaining 1/12 being appropriated in the following year; and (4) the tax on the self-employed payroll of a year is paid entirely in the following year. Assumption (1) was based on the actual 1955 figure of 1.022, increased slightly to allow for the higher 1956 wages. Assumption (2) was based on the estimate for September 1956 in Research and Statistics Note 4-1957, including as covered not only railroad and military personnel but also the eligible but still uncovered State and local government employees. Assumptions (3) and (4) are close to the actual 1956 experience.

Let  $P_{w,t}$  be the credited payroll of wage and salary workers,  $P_{s,t}$  be the credited payroll of the self-employed in year  $t$ , and  $P_t$  be the total creditable payroll in year  $t$ .

Then, the effective taxable payroll for year  $t$  is

$$\begin{aligned} & \frac{11}{12}(1.012) P_{w,t} + \frac{1}{12}(1.012) P_{w,t-1} + \frac{3}{4} P_{s,t-1} \\ &= \frac{11}{12}(1.012)(.88 P_t) + \frac{1}{12}(1.012)(.88 P_{t-1}) + \frac{3}{4}(.12)P_{t-1} \\ &= .8163 P_t + .1642 P_{t-1} \end{aligned}$$

If the combined employer-employee contribution rate is the same in year  $t$  as in the previous year, then the contribution income for the year is merely the product of such rate and the effective taxable payroll. On the other hand, if the contribution rate for employers and employees combined changes from  $r_{t-1}$  in year  $(t-1)$  to  $r_t$  in year  $t$ , then the contribution income for year  $t$  must be derived from the following formula:

$$r_t(.8163 P_t) + r_{t-1}(.1642 P_{t-1})$$

## F. Insured Population

The basic eligibility condition for all types of benefit payments is the possession of insured status by the individual on whose earning record benefits are to be paid. There are three types of insured status, namely, fully insured, currently insured and what might be termed "disability insured" (this being one of the requirements for disability benefits). Accordingly, in the procedure for estimating benefit payments, it is first necessary to establish the "foundation" of the insured population in various future years.

The insured population in each future quinquennial year is obtained by multiplying the total population in each age-sex group by an estimated percentage insured in that age-sex group. The term "insured population" means the fully insured persons plus the small number of currently but not fully insured individuals (for those beyond retirement age, extremely few would be in this latter category).

First, percentages as of January 1, 1957 were obtained, on a partially estimated basis. Estimates of the number of insured workers by age and sex were provided by the Bureau of Old-Age and Survivors Insurance, but these did not provide for insured status dependent on railroad employment or service in the armed forces. Accordingly, estimates of these additional insured were added.

The proportion of insured persons in the population will increase until all persons will have spent all their previous working life under the existing conditions of almost complete coverage. Another consideration is the assumed changes in the percent covered (see the preceding Section). A substantial increase in the percentages covered was assumed for middle-aged women, and this would tend to increase the percentages insured among middle-aged and elderly women. On the other hand, the percentages insured may decrease somewhat with the passage of time, as an increasing number of quarters of coverage are needed to meet the fully insured status requirements. As of the beginning of 1957, not more than 12 quarters of coverage were required for insured status, and those who attained age 65 for men and age 62 for women before July 1954 need only 6 quarters of coverage. By 1971 the requirement will have increased to 40 quarters of coverage at ages 41-64, and by the time the entire aged population consists of those who attained age 65 after 1970 the requirement will be 40 quarters of coverage for all the aged population as well.

In the light of these considerations, the percentages of the population at various ages who are insured in various future years were estimated. Table 3 shows the 1957 estimates and the assumed ultimate figures. The date at which the ultimate figures are assumed to be reached for males gradually increases from 1960 at ages under 45 to 2015 at ages 85 and over. For females, because of the increases in the assumed percentages covered up to the year 2000, the ultimate condition is reached more slowly. Use was made of cohort projections, especially at the oldest ages. The percentages insured in the cohort aged 65-69 at a given time will probably remain the same for this cohort as it ages, and thus they will also be the figures for ages 70-74 five years later, ages 75-79 ten years later, etc.

No precise method of estimating the future percentages insured has been devised. The error cannot be serious for males, however, since with close to complete coverage it is clear that the great majority of men will eventually be insured. The figures for females are more subject to variation and error, but here there enters in the fact that most women marry and so get benefits as wives or widows if not on their own earnings record.

Table 3

INSURED WORKERS AS PERCENTAGE OF TOTAL POPULATION BY AGE AND  
SEX, 1957 AND ASSUMED ULTIMATE FIGURES

Age	Males			Females		
	1957	Assumed Ultimate		1957	Assumed Ultimate	
		Low Cost	High Cost		Low Cost	High Cost
15-19	20	18	22	11	11	13
20-24	83	81	85	56	56	59
25-29	90	88	92	55	51	55
30-34	96	92	95	58	49	54
35-39	95	92	95	60	47	53
40-44	91	92	95	53	47	54
45-49	90	92	96	50	51	59
50-54	87	92	96	44	55	63
55-59	81	92	96	37	58	67
60-64	77	92	96	32	60	69
65-69	89	92	97	27	60	70
70-74	84	92	97	22	60	70
75-79	68	92	97	14	60	70
80-84	53	92	97	9	60	70
85 and Over	25	92	97	3	60	70

### G. Old-Age Beneficiaries

From a cost standpoint, the major beneficiary category is that of old-age beneficiaries, retired workers (who may be termed "primary beneficiaries" since they receive benefits on the basis of their own earnings record).

Because of the retirement test, not all insured persons beyond the minimum retirement ages of 65 for men and 62 for women receive old-age benefits. Then, too, there is the factor of non-receipt of benefits because eligible individuals do not file for them. Although in the early years of operation of a social insurance program there may be a considerable number of cases of this type, it is believed that in the long run the number of such cases will be negligible--especially considering that there is a 1-year retroactive period for which benefits can be paid before the month of filing claim if the individual is eligible in such months. In any event, the assumption that there is no loss of benefits solely because of non-filing seems appropriate and conservative.

The following procedure was used to estimate the number of aged insured males who would actually receive an old-age benefit. It was assumed that all aged covered male workers are fully insured. The old-age beneficiaries in current payment status were found by subtracting from the insured population that part of the covered workers with earnings greater than the retirement test permits, separately for ages 65-69 and 70-71; at the beginning of 1957, this group was estimated to be 63.7% of the covered population at ages 65-69 and 56.2% at ages 70-71. These percentages were assumed to remain constant in the future. In computing them for the beginning of 1957, the beneficiaries reported in current payment status were increased so as to be the same percentage of the insured population aged 65 and over as was the case at the beginning of 1956, since the backlog of applications due to the 1956 Amendments made the 1957 percentages abnormally low. At ages 72 and over the only reason an insured person would not receive a benefit is failure to apply for it, and it was assumed in the low-cost estimate that 1% would not apply.

The table below shows the resulting estimates of male old-age beneficiaries taken as a percentage of the male insured population at the beginning of 1956 and for the year 2000 and after:

<u>Age</u>	<u>January 1, 1956</u>	<u>2000 and After</u>	
		<u>Low-Cost</u>	<u>High-Cost</u>
65-69	59%	57%	70%
70-71	74	74	80
72 and Over	97	99	100

These percentages increase between 1956 and 2000 in the high-cost estimate not only because of the assumed decrease in the percentage of the total aged population who are assumed to be covered (see Table 2), but also because of the increase in the percentage of the total population who are estimated to be insured (see Table 3). This is because the increase in the percentage insured must come from an increase in the percentage of the non-employed aged population who are insured. In the low-cost estimate the effect of an increase in the percentage in covered employment at these ages and an increase in the percentage insured is to yield a slight decrease at ages 65-69 and no change at ages 70-71.

A complication arises in connection with female old-age beneficiaries since an insured female worker may elect an actuarially reduced benefit beginning at any age between 62 and 65. In order to deal with this situation, female insured workers were considered as made up of two classes, which for convenience have been labeled as "steady workers" and "nonsteady workers". In general terms, the "steady workers" are those women who have been in covered employment during most of their adult life until retirement age, while the "nonsteady workers" are women who have been out of covered employment most of their adult life, but at some time in the past have had 40 quarters of coverage and thus have become insured. Ultimately, about 38% of aged insured females are "steady workers" in the low-cost estimate and about 29% in the high-cost estimate. It has been assumed that all the "nonsteady workers" file claim for old-age benefits at age 62 and take the full actuarial reduction, and that none of the "steady workers" file claim for old-age benefits before age 65, with the same procedure followed for determining the number of beneficiaries in current payment status among them as is followed for insured men.

This procedure gives beneficiaries in current payment status in the middle of each quinquennial year. But this is less than the number of persons who receive a benefit for the given month because when a benefit is awarded to an individual, he may be entitled to benefits for some preceding months. After studying the relation between benefits paid and benefits in current payment status in various months over the last few years, it was decided to make an upward adjustment for this factor amounting to 5% in 1960 with the percentage gradually decreasing to about 4% in the ultimate years as recent awards become a smaller proportion of benefits in force.

## H. OASI Supplementary and Survivor Beneficiaries

Monthly benefits are payable to certain dependents of old-age beneficiaries (retired workers); such "supplementary beneficiaries" are wives, dependent husbands, and children. Further, monthly benefits are payable to survivor beneficiaries: aged widows, dependent widowers, aged dependent parents, children, and widowed mothers of such children.

### (a) Wife Beneficiaries

An important element in making cost estimates for wife's benefits is the proportion of aged insured males who are married. It is necessary to consider separate age groups within the aged male population, since the percent married decreases rapidly with increasing age. Percentages of insured males married in 1955 were taken as approximately the percentages recorded in the corresponding age groups of the male population of the United States in the 1950 census. It was believed that these percentages would increase in the future; due to improving female mortality, fewer aged males would have lost their wives through death. This trend would be only partially offset by remarriage.

In order to get some idea of the magnitude of the improvement to be expected, a cohort analysis was made of a hypothetical group of married couples in which the husbands were aged 50-54 (the youngest age group for which the data needed were available). The age distribution of the wives was taken on the basis of a cross-tabulation of ages of husbands and wives from the 1940 census (such data are not available from the 1950 census or from OASI experience, which is limited to retired workers aged 65 and over). At 5-year intervals, as these males passed through successive age groups, the percentage of surviving males with wives still living was computed under two mortality assumptions: (1) the U.S. Life Tables for 1949-51 and (2) the "low mortality" assumption for the year 2000 as given in Actuarial Study No. 46 (the assumption underlying the high-cost estimate). While it is recognized that this analysis does not take remarriage into account, it was thought that a comparison of the two sets of percentages would give some idea of the magnitude of the increase that might be expected in the proportions of males married in the various age groups. Table 4 shows the percentages married as recorded in the 1950 census and the ultimate percentages assumed to be reached by the year 2050, after taking into account the effect of mortality improvement.

In the computations for wife's benefits, it was necessary to estimate the proportion of wives of old-age beneficiaries who would not receive the full wife's benefit because they were eligible for old-age benefits based on their own earnings. As a first step, a cohort analysis similar to that described in the preceding paragraph was made to estimate the increase that might be expected in the



Table 4

PERCENTAGES OF AGED POPULATION WHO ARE MARRIED, BY  
AGE AND SEX--1950 CENSUS AND ASSUMED ULTIMATE

<u>Age</u>	<u>Percent Married</u>		
	<u>1950</u>	<u>Assumed Ultimate</u>	
	<u>Census</u>	<u>Low-Cost</u>	<u>High-Cost</u>
Males			
65-69	74.0	76	77
70-74	67.5	71	73
75-79	59.0	64	67
80-84	48.2	54	58
85+	33.6	36	38
Females			
62-64	57.9	62	69
65-69	48.9	55	64
70-74	36.6	45	55
75-79	24.7	30	44
80-84	14.2	19	26
85+	7.0	8	11

Table 5

PERCENTAGES OF INSURED FEMALES MARRIED FOR  
SELECTED AGES--ESTIMATED 1955 AND ASSUMED  
ULTIMATE DATA

<u>Age</u>	<u>Percent Married</u>		
	<u>Estimated</u>	<u>Assumed Ultimate</u>	
	<u>1955</u>	<u>Low-Cost</u>	<u>High-Cost</u>
62-64	27	59	67
65-69	21	52	62
70-74	15	42	53
75-79	9	28	43
80-84	4	18	25
85+	2	8	11

proportions of females married in the age groups above age 62. Using this analysis in conjunction with data from the 1950 census, ultimate percentages of females married were estimated by age groups. These percentages are also shown in Table 4. It was assumed that these percentages would gradually increase to the ultimate figures in the year 2050.

The 1950 census showed very nearly 10% of single and divorced women in each age group of aged females, the remaining 90% being married or widowed. This 10% figure is remarkably constant by age. The assumption was made that this would also be true in all future years. A distribution of the aged female population by marital status was thus obtained for every future year, by first taking 10% as single and divorced and then subtracting the estimated married from the remainder to yield the widowed.

It was assumed that 90% of the aged single or divorced women in the year 2050 would be insured. Thus, insured aged single and divorced women would constitute 9% of the total aged female population. It has already been estimated that the ultimate percent insured for the aged female population would be 60% for the low-cost estimate and 70% for the high-cost estimate. Under these assumptions, aged insured married and widowed females would constitute 51% and 61%, respectively, of the total aged female population.

The ratio of married women to widows in 2050 was assumed to be the same for the insured aged female population as for the total aged female population. On this basis, it was possible to estimate, by age groups, the ultimate percentages of married women in the insured aged female population (see Table 5). Corresponding percentages for each future quinquennial year were obtained by grading from the estimated 1955 figures into the ultimate figures. It was assumed that the ultimate percentages would be reached somewhat earlier for the younger segments of the aged female insured population.

Using these percentages, the married aged female insured population was computed for future years. On the basis of the distribution of aged females by marital status, the proportions of married aged females insured in each future year were determined. The number of insured wife beneficiaries was then obtained by assuming the same percent insured for aged wives of retired male workers as for all aged wives.

Wife beneficiaries have been estimated from data for male old-age beneficiaries, and thus automatically reflect the operation of the earnings or retirement test. It is true that wife's benefits might be withheld because of the woman's earnings, even though her husband's earnings are within the exempt amount of the retirement test. It has been assumed that the proportion of such cases would be negligible, since under such circumstances the woman would almost certainly be eligible for an old-age benefit in her own right, probably in an amount so that she would not be eligible for a wife's benefit. In this connection and with reference to other benefit categories to be discussed later, it

should be recognized that under the provisions of the present retirement test a beneficiary must have more than casual employment in order to have any benefits withheld. It has also frequently been possible for individuals to "limit" their earnings so that they do not exceed the prescribed maximum exempt amount of \$1200 a year.

As in the case of female old-age beneficiaries, a complication arises because wife's benefits claimed between ages 62 and 65 when a child is not present are permanently reduced (but the reduction does not apply to subsequent widow's benefits). It was assumed that all eligible wives would claim benefits at the earliest possible time--upon attainment of age 62 or upon the husband's retirement, if later.

#### (b) Widow Beneficiaries

In the computations for widow beneficiaries age 62 and over, the assumed percentages of insured male deaths, by age groups, where the deceased worker was survived by a widow were taken from 1951-54 claims data. In order to reduce the volume of computations required, the same percentages were used for all future years. Failure to provide for any increase in the proportions married among deaths of male insured workers is offset wholly or in part by the failure to allow for the fact that widows may have higher mortality than other females.

In 2050, it was assumed that the same percentages (92% and 97%) of aged widows would be widows of insured workers as the ultimate percentages of the aged male population who are insured. The numbers of surviving widows of insured workers as obtained by projection were gradually changed so that these percentages would be reached in 2050. It was then assumed that the percentage insured (on the basis of their own earnings) among aged widows of insured workers was the same as among all aged widows. From this, there were determined the numbers of widows eligible for both the old-age benefits and widow's benefits and those eligible only for widow's benefits.

Available data indicate that an insignificant proportion of widow's benefits are withheld because of earnings. Accordingly, no adjustment for the retirement test was made in connection with these benefits.

#### (c) Husband and Widower Beneficiaries

No direct account was taken of dependent husband's and widower's benefits since at present these categories are insignificant (at the end of 1958, the number of husband's benefits in current payment status was only 0.8% of the number of aged wife's benefits, and widower's benefits were only 0.1% of widow's benefits). Moreover, it is anticipated that in the future these categories will be even less important since almost all men will qualify on their own earnings record.

#### (d) Parent Beneficiaries

The category of parent's benefits is small and in the future will become smaller in relation to total beneficiaries as more parents become eligible for other types of benefits. Accordingly, it was considered adequate to use approximate methods to estimate the number and amount of

parent's benefits. It was assumed that the number of beneficiaries would bear a constant ratio to the total aged population (males aged 65 and over and females aged 62 and over) not eligible for any other type of OASDI benefit. This ratio, currently estimated to be 0.44%, was assumed to apply in all future years. Slight upward adjustments were made in the figures for the first few quinquennial years to show a small increase in parent beneficiaries in the immediate future.

Available data indicate that an insignificant proportion of parent's benefits are withheld because of earnings. Accordingly, no adjustment for the retirement test was made.

(e) Child Beneficiaries

The number of child beneficiaries in respect to old-age beneficiaries (retired workers) was obtained by multiplying the number of male old-age beneficiaries in various age groups in future years by the ratio of the number of child beneficiaries per male old-age beneficiary in the actual experience data for 1955. These ratios were .060 for men aged 65-69; .026 for men aged 70-74; .013 for men aged 75-79, and .005 for men aged 80 and over. No account was taken of the number of child beneficiaries of female old-age beneficiaries since the number is negligible (of the 1956 awards of child's benefits in respect to old-age beneficiaries, only 0.5% were in respect to female old-age beneficiaries).

The number of child survivor beneficiaries was estimated by starting with the population under age 18 in each future quinquennial year and projecting the proportion of such children who are orphans of male insured workers. This was done by estimating by means of life tables the number of children under age 18 in 1957, 1975, 2000, and 2050 whose fathers would not be living and then interpolating between the proportions for these years to obtain those for other years. The process used to estimate the numbers of deceased fathers incorporated a rough adjustment for the lower mortality of married males as compared with total males.

Child survivor beneficiaries in respect to female workers, who in most cases must be currently insured for such benefits to be payable, were estimated by increasing the estimate based on male deaths by 6.1%. This corresponds closely to the proportion of awards of these benefits in respect to women workers in 1955. Even though a rise in the labor force participation rate of women is assumed, this proportion will continue to be small, especially since the rise is assumed to occur at the middle and older ages, where there is relatively small likelihood of having eligible children, particularly very young ones who could draw benefits for many years.

No specific assumption concerning mortality of child beneficiaries was required, since these computations started from the numbers of living children in future years (as explained earlier). The failure to allow for termination of benefits due to marriage or adoption is probably more than offset by the failure to allow for payments to disabled child beneficiaries beyond age 18, who number about 3% of total child beneficiaries.

The reduction in an individual's benefit because of the application of the family maximum takes place after any deduction because of employment or other reason. To simplify deductions, the provisions authorize the deduction of as much of a benefit as is necessary to bring the family total to the amount it would be if the full benefit were withheld and the benefits of all other family members were recomputed. Thus, if deductions from a mother's or a child's benefit would be fully offset by increases to the remaining beneficiaries of the family, no deductions would be imposed. In the great majority of cases, children's earnings are probably small and within the amount of the earnings test. Accordingly, this has not been taken into account in estimating child beneficiaries.

(f) Mother Beneficiaries

The number of mother's benefits was obtained by multiplying the number of child beneficiaries by a factor that was a little less than the current ratio of mothers to children for the low-cost estimate, and a little more for the high-cost estimate. Thus, no assumption concerning marital status was directly involved in these calculations.

In the case of mother's benefits, it is known that the earnings test applies in a significant proportion of cases. Since mother beneficiaries have been estimated by assuming a constant ratio between mother and child beneficiaries (based on actual experience for benefits in current payment status), the earnings test as it applies to mothers has been implicitly taken into account. It has been assumed that in the future mothers of young children will be in substantial gainful employment and affected by the earnings test to about the same extent as now, when about 30% are in this category.

(g) Effect of "Anti-Duplication" Provision

When the same individual is eligible for two different benefits, the law provides that the amount of the larger of the two benefits shall be paid. The only cases of this kind that have any appreciable effect on the cost of the program are those in which a woman is eligible for an old-age benefit and also for a wife's or widow's benefit. In such cases, the wife's or widow's benefit is not paid when it is less than the old-age benefit. When the wife's or widow's benefit is the larger, the beneficiary is paid the old-age benefit and also a wife's or widow's benefit in an amount equal to the excess of the latter over the old-age benefit.

It is true that a woman who knew that her wife's or widow's benefit would be larger might not file a claim for an old-age benefit, and it might not come to the attention of the Bureau of Old-Age and Survivors Insurance that she was entitled to the latter benefit. Thus, she might be paid the full wife's or widow's benefit and no old-age benefit. This would not affect the total cost of the system, but only the distribution among the various benefit categories. Since it would sometimes be to the woman's advantage and (with the exception of the case of a reduced old-age benefit between ages 62 and 65 when a widow's benefit is also available) never to her disadvantage to file for both benefits, it has been assumed in the long-range cost estimates that this will always be done.

Accordingly, the calculations for wife's and widow's benefits have been made separately for: (1) those uninsured wife and widow beneficiaries who receive the full wife's or widow's benefit because they are ineligible for an old-age benefit, and (2) those wife and widow beneficiaries who are insured and could therefore receive a "residual" wife's or widow's benefit consisting of any excess of the full wife's or widow's benefit over the old-age benefit to which they are entitled.

Using the distribution of the aged female population by marital status and insured status derived as described previously, the proportion of aged wives of male old-age beneficiaries who are insured (eligible for old-age benefits) was estimated by assuming the same proportion insured in each future year as in the total aged married female population. Similarly, it was assumed that the proportion insured among aged widows of insured workers will be the same in each future year as in the total aged widowed female population. These assumptions led to estimates of the uninsured receiving the full wife's or widow's benefit and of the insured groups receiving partial wife's or widow's benefits or none at all.

In estimating the benefit costs for those women who will receive a partial wife's or widow's benefit, the assumption was made that all such women will come from the "nonsteady worker" category. In other words, it was assumed that a "steady worker" will always have an old-age benefit larger than any wife's or widow's benefit for which she might be eligible, and therefore would not receive the "residual" benefit.

The 1954 distribution of covered earnings was taken as representing the general shape of the earnings distribution curve. The percentage of aged insured wives of male old-age beneficiaries who, in the ultimate condition of the system, will actually be receiving a "residual" wife's benefit was estimated to be 29% of all such wives for the low-cost estimate and 32% for the high-cost estimate. On the basis of current data on dual entitlements, the corresponding percentage at the end of 1956 was estimated to be about 39%. Accordingly, this percentage was graded down from 39% in 1960 to reach the ultimate figures in 1980.

The "residual" widow's benefits were dealt with in similar fashion. The percentage of insured eligible widows receiving a "residual" benefit was estimated to be about 40% currently, and 61% (low-cost) and 66% (high-cost) ultimately. In the computations, this percentage was graded up fairly rapidly from 40% in 1960 to 58% and 61% in 1980, reaching the ultimate figures in 1990. Subsequent analysis has indicated that the current ratio is probably about 50% rather than the 40% used; the effect of changing the early year figures would be quite small from a long-range standpoint because the residual widow's benefits are low in magnitude for the next two decades.

(g) Lump-Sum Death Payments

A lump-sum death payment is available upon the death of a fully or currently insured worker, whether such death occurs before or after retirement. Actually, in some instances more than one payment may be made for a particular death because several individuals shared in meeting the burial expenses; in awards of 1958 there were 4.1% more payments than deceased workers. For cost-estimating purposes, however, there need be considered only the number of deaths for which payments are made and the average payment per death.

The numbers of insured deaths are obtained by applying the death rates used in the population projections to the insured population, by sex and age group in each future quinquennial year. The resulting figures may be overstated for two reasons. First, the mortality of the actively employed covered group, particularly at the younger ages, is probably lower than that of the total population. Second, in the rare cases where there are no surviving relatives or friends of the deceased worker, no one may be eligible to receive the lump-sum death payment. It is believed that these two factors are of minor importance and can be disregarded.

## I. Disability Beneficiaries

It is far more difficult to select reasonable assumptions for disability cost estimates for a new program than for programs providing retirement and survivor benefits. The latter are influenced by mortality and retirement rates that can be estimated within a narrow range of variation. On the other hand, rates of becoming disabled and rates of mortality and recovery for disabled persons are subject to very wide fluctuations. These are affected by interpretation of the definition of disability, economic conditions, public awareness of the benefits available, and psychological outlook of the covered persons. It has been stated that the potential disability cost burden can be determined only by instituting the plan and then studying experience thereunder. But this must be qualified to the extent that the early experience is not sufficient to give a complete or accurate picture, as many past disability experiences have evidenced.

In preparing the cost estimates for the disability benefits in the OASDI system, as included by the 1956 Amendments, a wide range was selected for the assumed cost factors. In the high-cost estimates, disability incidence rates for men were based on the so-called 165% modification of class 3 rates (which include increasingly higher percentages for ages above 45); this set of rates corresponds roughly to the life insurance company experience during the early 1930's. Incidence rates assumed for women were 100% higher than for men. Termination rates were class 3 rates, also relatively high--to be consistent with the high incidence rates assumed.

For the low-cost estimates, disability incidence rates for men were based on 25% of those used in the high-cost estimates or, in other words, about 45% of the class 3 rates. Incidence rates assumed for women were 50% higher than for men. Termination rates were based on German social insurance experience for 1924-27, the best available recorded experience with relatively low disability termination rates (and therefore consistent for use with low incidence rates).

The incidence rates actually used for both estimates were 10% lower than the basic rates described above because, unlike the usual definition in insurance company policies, disability is not presumed after 6 months to be total and of expected long-continued duration, but instead permanence must be proved at that time. It should be emphasized that the estimates have been based on percentages of insurance company rates of disability incidence, not because it was anticipated that OASDI experience would necessarily correspond therewith, but rather only after analysis and comparison of many other disability experiences. The use of modified insurance company rates simplified the computational processes.



It will be noted that the low-cost estimate assumed low incidence rates, which produce low costs, and low termination rates, which produce higher costs, considered necessary since with low incidence rates there would tend to be low termination rates because of few recoveries. On the other hand, the high-cost estimate was based on high incidence rates and somewhat offsetting high termination rates (the result of many recoveries).

In addition to the disability incidence and termination rates, it was necessary to estimate the insured populations, by age and sex in past and future years, to which were applied the appropriate disability incidence rates. It will be recalled that there are special insured status provisions for disability benefits--20 quarters of coverage out of the last 40 quarters and currently insured, under the 1956 Amendments (the 1958 Amendments substituted the requirement of fully insured status for currently insured). Since there were no data available as to the effect of these insured status provisions, it was assumed that 95% of the fully insured men were also insured for disability benefits. For women, the population assumed to be insured for disability benefits was taken as 90% of the larger of (a) the fully insured population and (b) the covered population, separately for each quinquennial age group in each calendar year.

The appropriate incidence rates were applied to the population insured for disability benefits to obtain the number of persons disabled each year, by sex and age groups. These were projected by the assumed termination rates, disregarding for benefit purposes those during the first 6 months of disability and those under age 50 (until they survive to age 50), and terminating all disabled individuals upon attainment of age 65.

The 1956 Amendments, to which this discussion applies, did not contain provisions for benefits to dependents of insured workers receiving disability benefits, which were incorporated in the 1958 Amendments. Under such provisions it is simple to compute the numbers of such supplementary beneficiaries, wives aged 62 and over, dependent husbands aged 65 and over, and eligible children and their mothers regardless of age. The first two categories can be disregarded since few individuals would be involved. There are few dependent husbands and few wives aged 65 and over of disabled men under age 65. There may be a number of wives aged 62-64 of disabled men under age 65; however, these can, to a considerable extent, be disregarded because of the reduction factors applying if the wife claims benefits before age 65. The number of eligible children of disability beneficiaries, and the resulting number of mother (wife) beneficiaries can be readily estimated from proportions derived from census data and from survivor benefit data. For men in the age groups at which disability benefits are payable who have children under 18, it can be assumed that there is also an eligible wife present, a slight overstatement that reasonably offsets disregarding aged wives and dependent husbands of disability beneficiaries; furthermore, the presence or absence of the wife may have no effect on the benefits payable to the family because of the maximum family benefit provisions.

## J. Average Benefits and Benefit Disbursements

The benefit disbursements by category are obtained by multiplying the numbers of beneficiaries (by age and sex groups where appropriate) by the average benefit payments. This section describes how average benefit payments are obtained.

The average wage for benefit computation purposes, on the basis of 1956 earnings levels, was estimated for insured workers who reach retirement age far enough in the future so that the ultimate percentages of the population in covered employment have been in effect throughout their working life. This was done by taking the mean of the maximum and minimum possible average wage figures. For the maximum average wage, it was assumed that uninsured workers have no coverage at all, and for the minimum it was assumed that they all have 9-3/4 years as 4-quarter workers (the maximum number of quarters of coverage that a worker could have without being fully insured). The resulting averages are shown in Table 6, first without adjustment for drop-out and disability freeze, and then with such adjustment.

In order to take account of the disability freeze, it was assumed that the percentage disabled in each age group was the same as in Hunter's Disability Table for the low-cost estimate and twice as high in the high-cost estimate. In addition to the regular 5-year drop-out applicable for all persons, this produces an average drop-out in the low-cost estimate of .46 years for males and .35 for females when averaged over both those who are disabled and those who are not.

The average primary insurance amount (PIA) cannot be obtained by substituting the average earnings in the PIA formula as is done for an individual worker. The average PIA is a little less than the PIA based on the overall average earnings, because as average wage increases above \$110 a month, the PIA is a decreasing percentage thereof. The average PIA has been estimated mathematically and is shown in Table 6 together with the amount obtained by applying the PIA formula to average earnings.

In the low-cost estimate, both the average wage for benefit computation purposes and the average PIA are a little larger than in the high-cost estimate. This is proper because in both estimates the same average earnings for all covered workers in each age group (and the same percentages covered, in most age groups) are assumed, but in the high-cost estimate a larger proportion of workers becomes insured with, as a result, a smaller average amount of coverage.

On the basis of a distribution of earnings of 2-, 3-, and 4-quarter workers in 1954, it appears that the dividing line between the two groups of female workers--"steady" and "nonsteady"--falls at approximately \$2500 of average annual earnings when employed, and it has been estimated mathematically that the ultimate average wage and

Table 6

ULTIMATE AVERAGE WAGE FOR BENEFIT COMPUTATION PURPOSES AND  
ULTIMATE AVERAGE PIA OF RETIRED WORKERS

Cost Estimate	Average Wage		Average Annual PIA	
	Without Drop-Out and Disability Freeze	With Drop-Out and Disability Freeze	Derived by Formula from Average Wage	Estimate
Low-Cost				
Males	\$2944	\$3280	\$1118	\$1106
Females	1282	1481	758 a/	695 a/
High-Cost				
Males	2806	3199	1102	1088
Females	1139	1328	728 a/	663 a/

a/ Does not represent the actual average old-age benefit since females who retire before 65 have their benefits reduced.

Table 7

ULTIMATE AVERAGE WAGE FOR BENEFIT COMPUTATION PURPOSES OF RETIRED FEMALE WORKERS  
AND ULTIMATE AVERAGE PIA AND AVERAGE OLD-AGE BENEFIT, FOR  
"STEADY WORKERS" AND "NONSTEADY WORKERS" SEPARATELY

Cost Estimate	Average Wage a/	Average Annual PIA		Average Annual Old-Age Benefit b/
		Derived by Formula from Average Wage	Estimate	
Low-Cost				
"Steady Workers"	\$1,700	\$802	\$742	\$742
"Nonsteady Workers"	1,350	732	667	534
High-Cost				
"Steady Workers"	1,475	757	694	694
"Nonsteady Workers"	1,270	698	650	520

a/ After adjustment for drop-out and disability freeze.

b/ For "nonsteady workers," actuarially reduced because of retirement at age 62.

average annual PIA for these separate groups are as shown in Table 7. These averages have been determined so as to produce the overall averages for female workers given in Table 6. It will be noted that the average wage figures for "steady workers" are less than \$2500. The results obtained for average earnings of female workers (Table 6) make it appear that the great majority of women (including the "steady worker" group) have extended periods without gainful employment which tend to reduce their career average wage.

For female "nonsteady workers," the average annual PIA's in Table 7 were assumed to apply to all ages and all future years. For female "steady workers" and for male workers, the average old-age benefits were graded upward from current averages to the ultimate figures. In the case of male workers the ultimate average benefits were assumed to be reached between 1970 and 2000 (later for the older workers), and for female "steady workers" between 1995 and 2010.

Table 8 shows the ultimate average annual benefits assumed for the various benefit categories, together with comparable current averages based on the most recent data available, both for awards and for benefits in current payment status. In each case, the approximate year in which the assumed ultimate average benefit is reached is shown.

The average wife's benefit (before actuarial reduction, in the case of wives without insured status) in each year was taken as 50% of the average male old-age benefit in the same year except for a small upward adjustment in the early years, starting at 3% in 1960 and disappearing in 1990. This adjustment was intended to reflect the higher average wage of married males as compared with unmarried males. It is assumed that uninsured wives will retire as soon after reaching age 62 as their husbands retire. Wife's average benefit payments were first computed as if there were no reduction for early retirement, or, in other words, as 50% of the husband's PIA. An average reduction factor for early retirement was then estimated.

To estimate this reduction factor, a cohort analysis based on the age distribution of old-age benefit awards to married males in 1955 was made. In each age group of male old-age beneficiaries the age distribution of their wives was assumed to be in accordance with a cross-tabulation of ages of husbands and wives from the 1940 census (such data are not available from the 1950 census). These couples were projected through successive age groups at 5-year intervals using projected life tables for 1975 (based on mortality rates obtained by averaging those of the low-mortality and high-mortality assumptions in Actuarial Study No. 46). It was assumed that each wife would claim a wife's benefit upon her husband's retirement or upon attaining age 62, whichever is later. On this assumption the percentage of reduction in aggregate wife's benefits for this group because of the inclusion of wives who have claimed benefits before age 65 was computed at 5-year

Table 8

## AVERAGE ANNUAL BENEFITS--MOST RECENT ACTUAL AND ASSUMED ULTIMATE

Type of Benefit	Most Recent Actual Data <sup>a/</sup>		Assumed Ultimate		
	In Current Payment Status	Awards	Low-Cost	High-Cost	Approximate Year When Reached
Male Old-Age	\$819	\$909	\$1106	\$1088	1990
Female Old-Age <sup>b/</sup>	614	654	599(695)	562(663)	2015
Wife's <sup>b/ c/</sup>	412	415	492(553)	484(544)	1990
Widow's <sup>c/</sup>	612	658	830	816	1990
Parent's	621	725	830	816	1990
Child's (life)	265	299	354	350	1975
Child's (survivors)	489	551	628	618	1970
Mother's	587	682	737	725	1970
Lump-Sum	--	203	203	196	2050 <sup>d/</sup>

<sup>a/</sup> For old-age benefits, averages are for awards during 1956 and benefits in current payment status at end of 1956. For both sexes combined, average old-age benefit in current payment status was \$757 on 12/31/56 and \$774 on 11/30/57, while average old-age benefit awarded was \$808 for 1956 and \$835 for November 1957. For other benefits averages are for awards during November 1957 and benefits in current payment status at end of November 1957.

<sup>b/</sup> Figures in parentheses represent average before actuarial reduction.

<sup>c/</sup> Not receiving old-age benefits.

<sup>d/</sup> Ultimate average lump-sum death payment for both sexes combined is reached only in 2050 because the sex ratio of the insured population does not stabilize before that time. Ultimate average lump-sum payments for males (\$239 for low-cost and \$236 for high-cost) are assumed to be reached in 1970. Ultimate average lump-sum death payments for females (\$141 for low-cost and \$137 for high-cost) are assumed to be reached about 2015.

intervals. By interpolation, the average percentages of reduction were obtained for each single year. It was assumed that a new cohort identical with the one described is added to the hypothetical system each year, and the average percentage of reduction was obtained for each year for the entire system. In about 20 years the hypothetical system reached a stable condition with an overall reduction of 11%.

In the actual situation the stable condition would be reached more slowly, because the hypothetical system does not take into account the large backlog of wife beneficiaries already on the roll with unreduced benefits at the time the 1956 Amendments went into effect. It was therefore postulated that the ultimate reduction of 11% would be reached in 1990. It was estimated on the basis of current claims data that the overall reduction for 1957 would be about 2%. The reduction factor was graded upward from this figure to 11% in 1990.

Both on the basis of hypothetical calculations relating to the ultimate condition of the system and through analysis of current data, the average benefit paid to insured wives who receive an old-age benefit smaller than the wife's benefit was estimated at about 32% of the average wife's benefit of uninsured wives. Accordingly constant percentages of 30% for the low-cost estimate and 35% for the high-cost estimate were used.

The average widow's benefit in the case of uninsured widows should ultimately be about 75% of the average male old-age benefit, since the widow's benefit is 75% of the PIA. The average widow's benefit in current payment status at the end of 1956 was 73.5% of the male old-age benefit at that time. Accordingly, this ratio was assumed to be 75% for all years. The average "residual" widow's benefit for insured widows who receive old-age benefits smaller than their widow's benefit was estimated to be constant at 32% (low-cost) and 37% (high-cost) of the average widow's benefit of uninsured widows.

Calculation of average survivor child's benefit (in essence, 75% of the PIA for the youngest child and 50% each for other children) and average mother's benefits (75% of the PIA) is more complicated because of the operation of the family maximum provision, which places an upper limit on the total amount of monthly payment to a single family. Even when the family maximum does not apply, the average child's benefit depends on the number of children per family. Thus, the individual monthly benefit payable to the mother and to each child is less (for the same PIA) in a large family than in a small one.

From data on family benefits in current payment status on December 31, 1956 by type of family (number of children receiving benefits and whether a mother's benefit is payable), it was determined that the monthly benefit to an individual child was, on the average, 56.8%

of the corresponding PIA. Accordingly, the ultimate average child's benefit was taken as 56.8% of the ultimate male old-age benefit as shown in the accompanying table. This produces an ultimate average child's benefit of \$628 in the low-cost estimate and \$618 in the high-cost estimate.

The average child's benefit in current payment status on November 30, 1957 was about \$490. However, the corresponding average for benefits awarded in November 1957 (based on a higher average wage) was about \$550. Further computations indicated that a mature distribution of family sizes in conjunction with the average wages reflected in the current awards would produce an average child's benefit of about \$590, which is not far from the ultimate figures. Accordingly, the average child's benefit for future years was taken on a graded basis, starting at the current average for benefits in current payment status and reaching the ultimate figure in 1970.

The ultimate average mother's benefit, obtained by a similar procedure, was \$737 for the low-cost estimate and \$725 for the high-cost estimate. The average mother's benefit was about \$590 for benefits in current payment status on November 30, 1957 and about \$680 for awards in November 1957. It was estimated that a mature distribution by family size in conjunction with the average wages reflected in November awards would yield an average mother's benefit of about \$710, which again is not far below the ultimate figures. The average mother's benefit for future years was graded upward from the current average for benefits in current payment status to reach the ultimate value in 1970.

The monthly amount of a parent's benefit is 75% of the primary insurance amount. The average parent's benefit in current payment status on December 31, 1956 was 74.4% of the average male old-age benefit in current payment status on the same date. Accordingly, the assumption was made that in future years the average parent's benefit would be 75% of the average male old-age benefit. Multiplication of this average benefit by the assumed number of parent beneficiaries gives the estimated benefit disbursements.

The lump-sum death payment for an insured worker is 3 times the PIA, subject to a maximum payment of \$255. On the basis of a distribution of earnings of 2-, 3-, and 4-quarter workers in 1954, it was estimated that for a group of workers whose "career average covered earnings" had this same distribution the lump-sum payment on death would average 21.65% of the annual PIA for males and 24.08% for females, as against 25% without the \$255 maximum.

The ultimate average lump-sum payment for males was obtained by taking 21.65% of the ultimate average annual PIA's as given in Table 6. This gives an annual average lump-sum payment for males of \$239 for the low-cost estimate and \$236 for the high-cost estimate. In the case of females, these averages differ for the "steady workers" and the "nonsteady workers." On the basis of the same 1954 earnings

distribution, it was estimated that the ultimate average lump-sum death payment would be \$179 for the former group and \$129 for the latter group. For both sexes it was assumed that the ultimate figures would be reached in 1970. The values were graded by taking 85% of the ultimate figures for 1960 and 95% for 1965.

The average benefit for disabled workers between ages 50 and 65 was taken to be the same as that for retired workers in the ultimate conditions, separately by sex, using the "steady worker" average for women. The figures for the early years were estimated from current awards of old-age benefits based on recent earnings. Figures for intervening years were obtained by interpolation between the initial and ultimate ones, which were not very far apart.



## K. Railroad Retirement Financial Interchange

The 1951 Amendments to the Railroad Retirement Act provided that calculations as of June 30, 1952 should be made jointly by the Railroad Retirement Board and the Secretary of Health, Education, and Welfare to determine the amount that would place the OASI Trust Fund in the same position in which it would have been if service as a railroad employee after December 31, 1936 had been included in the term "employment" as defined in the Social Security Act. This amount will be designated as the "initial amount." Calculations of the effect of current experience are to be made in the future so as to maintain this position by appropriate transfers between the two systems. The 1956 Amendments provided for the same procedure to be followed for the DI Trust Fund, which began operations in 1957 and so had no "initial amount."

Actually, since the Railroad Retirement Board has the bulk of the necessary data, its staff made the initial calculations (as has also been done for all subsequent determinations). Because of the large number of beneficiary cases involved, each of which would require individual adjudication, the analysis of benefit payments has been based on a 1% sample. The methodology and assumptions underlying the initial determination were discussed in detail at joint meetings of the actuarial staffs of the two agencies. At least once each year thereafter, meetings have been held to consider the developing situation and new problems, including those arising from legislative changes. Staff members of the Social Security Administration have also examined the adjudication operations in connection with the 1% sample.

The "initial amount" was calculated at \$488.2 million due the OASI Trust Fund from the Railroad Retirement Account. Other provisions relating to these determinations included:

1. Similar determinations are to be made as of June 30, 1953, and as of the close of each fiscal year thereafter.
2. The results of these determinations establish the annual amounts to be transferred between the OASDI Trust Funds and the Railroad Retirement Account.
3. So long as any part of the "initial amount" remains in the Account to the credit of the OASI Trust Fund, the annual amount as determined in item 2, which would otherwise be required to be transferred from that Trust Fund to the Account, would be offset against such remaining part of the "initial amount."
4. Interest is to be paid on any balance held in the Account to the credit of the OASI Trust Fund. The interest rate is to be based on the average rate borne by all interest-bearing obligations forming a part of the Public Debt.

Upon completion of the determination made as of June 30, 1956, it was established that the "initial amount" had been reduced from \$488.2 million to \$60.5 million. The determination as of June 30, 1957 indicated a gross amount of \$181.8 million due the Railroad Retirement Account. Since the balance in the Account to the credit of the OASI Trust Fund was \$60.5 million on June 30, 1957, a transfer from the Trust Fund to the Account of \$121.3 million, plus \$3.1 million in interest, was made in July 1958. From this time on, all balances between the OASI Trust Fund and the Account will be payable currently, as is the case for the DI Trust Fund.

It is anticipated by the actuarial staff of the Social Security Administration that there will be a flow of funds from the Trust Fund to the Account for some years into the future. By 1970 or 1980, however, the flow will be from the Account to the Trust Fund. For some years it has been believed that ultimately the overall results of the financial interchange would be favorable to the Trust Fund. However, at the present time, considering the steady decline in total railroad employment, this is no longer as certain as it once appeared. In any event, though, the relative effect on the financing of the OASDI will be small. The actuaries of the Railroad Retirement Board have always believed that the overall results will be favorable to the Account.

Cost estimates for the financial interchange provisions made by the actuarial staff of the Social Security Administration were based on benefits being paid by the Railroad Retirement system in September 1957, the financial interchange calculations, the age distribution of active railroad employees, and a projection of beneficiaries made by the Railroad Retirement Board.

The Railroad Retirement beneficiary rolls of September 1957 were adjusted for such items as the differences in minimum retirement age for widows and spouses under the two systems. A gross amount due Railroad Retirement for OASDI benefits in 1957 was obtained by predicating an average annual amount for each benefit category, based on gross amounts calculated in the interchange. The male old-age benefit disbursements were projected on a gross basis by reference to Railroad Retirement Board projections and the current age distribution of active railroad employees. Gross amounts were adjusted for benefits already being paid by OASDI. This offset yields a net interchange amount of benefit disbursements. Assuming a net transfer of approximately \$190 million for calendar year 1957, offsets against the gross amounts were taken to give results consistent with this net figure. For future years, offsets for the male old-age benefits were assumed, and other major benefit categories were projected on a net basis as assumed percentages of the net male old-age benefits.

Contribution income in respect to the financial interchange provisions was based on scheduled OASDI rates and on an assumed level annual taxable railroad payroll of \$5.0 billion.

## L. Administrative Expenses

The principal elements in the administrative expenses of the OASDI system are the costs of collecting contributions, accounting for credited earnings, and paying benefits. The magnitude of the first two items depends primarily on the number of persons in covered employment, while the third is largely a function of the number of beneficiaries. It is, of course, recognized that costs are relatively higher for beneficiaries awarded benefits in the year than for those continuing on the roll, and likewise for beneficiaries under age 72--subject to the retirement test--than for those aged 72 and over, but this distinction is not made in the administrative expense assumptions for the OASI portion of the system.

Accordingly, the administrative expenses payable out of the OASI Trust Fund (including the administrative expense charge under the Railroad Retirement financial interchange provisions) were projected by means of formulas that relate the administrative expenses in a given year to the number of persons having any covered employment in that year and to the number of beneficiaries in the middle of the year. These formulas were intended to produce a reasonable range about the current administrative expenses when applied to current data on covered employment and the number of monthly beneficiaries.

The administrative expense assumptions for the OASI portion of the system were as follows: For the high-cost estimate, for all future years, \$1.30 per covered person plus \$5.40 per monthly beneficiary (these factors when applied to 1957 actual data duplicate the actual administrative expenses). For the low-cost estimate, the corresponding figures were \$1.20 and \$5.20, respectively, for 1960 and as \$1.10 and \$5.00, respectively, for 1965 and thereafter.

The administrative expenses of the DI portion of the system for all future years were assumed to be as follows:

<u>Factor</u>	<u>Low-Cost Estimate</u>	<u>High-Cost Estimate</u>
Per Covered Person	\$.075	\$.090
Per Disability Beneficiary on Roll	\$2.50	\$3.00
Per Disability Benefit Award	\$25	\$30

The results obtained by the application of these factors yielded estimates of the amount of administrative expenses for use in developing the progress of the Trust Funds. These figures should not be considered as precise measures of administrative costs such as may be used in budget requests.

## M. Interest Basis

The actuarial cost estimates made for the OASI program as it was immediately preceding the 1956 Amendments used, in general, a 2.4% interest rate--both for the development of level-premium costs and for the computation of the progress of the Trust Fund. This rate closely approximated the actual earned interest rate of the assets of the Trust Fund.

The 1956 Amendments contained two provisions relating to the interest rate for public debt obligations (special issues) issued for purchase by the Trust Funds. The first change--rounding the rate to the nearest 1/8% rather than to the next lower 1/8%--would obviously have the long-run effect of giving the Trust Funds a higher interest return. The second change--basing the interest rate on the average coupon rate of all long-term (more than 5 years) marketable issues instead of on the average coupon rate of the entire interest-bearing public debt--in most instances could be expected to yield a higher return for the Trust Funds since long-term interest rates are usually higher than short-term ones. Accordingly, in order to recognize this change in the law, it was decided to use an interest rate of 2.6%, rather than 2.4%.

During 1957, when the new cost estimates were being prepared, and subsequently there occurred one of the most violent movements of interest rates (especially yield rates in the open market) that has taken place in this country. Thus, during the middle of 1957, the yield rates on the open market were as high as 4%, and some new issues even bore this high a coupon rate, while others bore rates of 3½% or more. Toward the close of the year, these yield rates on the open market fell sharply, and in the early part of 1958 were only about 3% for the issues with the longest terms and as low as 2½% for the shortest term issues.

Most of the new public issues in 1957-59 were for relatively short periods. The average rate on the entire interest-bearing public debt rose to reflect the high rates on these short-term issues (to over 3% in the middle of 1959). At the same time, the average coupon rate on all long-term marketable issues outstanding increased only slightly, although the yield rate on such issues in the open market was as high as 3¾ to 4% in the latter half of 1959--as a result of the market price dropping well below par. Accordingly, the new special issues acquired by the Trust Funds following the enactment of the 1958 Amendments continued to bear a rate of 2½% until July 1958, at which time and subsequently the rate has been 2-5/8%.

As of June 30, 1957, more than 90% of the investments of the Trust Funds bore an interest rate of exactly 2½%, while a negligible proportion had a rate under 2½%, and the remainder had a rate more

than  $2\frac{1}{2}\%$ . Most of the latter group were at  $2\text{-}3\frac{1}{4}\%$ , although there were some with up to  $3\text{-}5\frac{1}{8}\%$ . The average coupon rate was  $2.53\%$ , generally payable semi-annually. The equivalent rate of interest compounded annually (as used in the cost estimates) was  $2.55\%$ .

The preceding rates are based on the investments of the Trust Funds and, of course, would be lower if based on the total assets including the cash balance. On June 30, 1957,  $3.32\%$  of the Trust Funds was held in cash and was thus not earning interest. The proportion of the fund held in cash is, however, much larger on the last day of any month than during most of the month because the cash balance is increased just before monthly benefit checks are issued, at the beginning of each month. Taking this factor into account, the average interest rate on total assets was about  $2.50\%$  as of June 30, 1957. As a matter of interest, it may be noted that as of June 30, 1959, the average coupon rate of the investments of the Trust Funds was  $2.61\%$ , and the average interest rate of the total assets was about  $2.55\%$ .

The problem of assuming an interest rate to be used in the long-range cost estimates is difficult as it involves estimating the future trend of the average rate on the long-term marketable public debt. Over the short-range, much depends upon whether the Managing Trustee continues to invest primarily in the special issues now carrying a relatively low rate, whether a much larger proportion of new public issues, bearing a higher rate, are assigned to the Trust Funds than in the past, and to what extent the Managing Trustee goes into the open market for securities yielding a higher rate than special issues. Also involved is what policy the Managing Trustee adopts (or continues) in regard to converting the 1-year special issues into ones of longer term.

Considering the wide fluctuations that occurred in 1956-57 when the cost estimates were being developed, including both the increase to  $4\%$  and the subsequent decline and then rise, it was assumed that for long-range purposes a rate of  $3\%$  is reasonable. It was recognized, however, that such a rate could almost certainly not be achieved immediately so, rather arbitrarily, it was decided that in developing the progress of the Trust Funds a rate of  $2.7\%$  would be used for 1958,  $2.8\%$  for 1959,  $2.9\%$  for 1960, and  $3.0\%$  for 1961 and thereafter. On the other hand, for purposes of computation simplicity (and since little difference would have arisen if graded interest rates had been used for the first few years), it was decided to use a level rate of  $3.0\%$  for the level-premium cost computations. Alternatively, however, figures were developed for interest rates of  $2.6\%$  (as used in the cost estimates made at the time of 1956 legislative action) and  $3\frac{1}{2}\%$  (as representing a reasonable possible maximum).

## N. Progress of Trust Fund

The year-by-year future progress of the Trust Funds is obtained in a straightforward fashion from the annual figures for benefit payments, administrative expenses, and contributions (interpolated for single years, as indicated previously).

First, the net income for the year is found by subtracting the benefit payments and administrative expenses from the contributions. The net income can, of course, be either positive or negative.

Next, interest on the net income is computed for  $\frac{1}{2}$  year (which can be either positive or negative) and added to interest computed for the entire year on the balance in the Trust Fund at the end of the previous year. The basis of  $\frac{1}{2}$  year's interest being earned on the net income is an approximation that, in essence, is based on the assumptions that income and outgo are evenly distributed throughout the year and that available monies are invested immediately. The actual operations do not correspond exactly with these assumptions. For instance, contribution income is much larger in the second quarter of the calendar year than in the other quarters, and lower in the first quarter. Likewise, contribution income fluctuates within each quarter, being by far the highest in the second month. Benefit and administrative expense outgo move, more or less, at a steady pace during the year although there is usually a noticeable rise in the first few months of the calendar year, followed by a levelling off--due to the many year-end retirements, which are adjudicated in 1 or 2 months (with retroactive payments). Furthermore, interest income is largely concentrated in June and December. In balance, the "uniform distribution" assumption for net income seems reasonably valid.

Finally, the balance in the Trust Fund at the end of the given year is obtained by adding to the balance at the end of the previous year the net income and the interest earned during the year.

## O. Determination of Level-Premium Costs

Previous sections have described how the several different elements in the cost estimates have been obtained. This Section will describe specifically how the level-premium costs and equivalents are derived for benefit payments, administrative expenses, contributions, and interest on the existing Trust Fund.

First, the present values of each of these time series of figures is obtained. The term "present value" means the value at the current moment of a payment that is to be made at a given date in the future, taking into account interest earnings. For example, with an interest rate of 3%, the payment of \$1000 at the end of 10 years has a present value of \$744, which means that the compound interest on \$744 over a period of 10 years is sufficient when added to the \$744, to yield \$1000. In a similar fashion, and through appropriate actuarial formulas, present values can be obtained for series of payments--whether beginning immediately or after a certain time. Likewise, the present value for a series of annual payments running into perpetuity can be obtained. For example, the present value at 3% interest of a payment of \$100 at the end of every year from now into perpetuity is \$3333 (which can be readily seen since annual interest at 3% on this sum is \$100). Correspondingly, a payment of \$100 beginning 11 years from now and running into perpetuity, has a present value of \$2480 (\$3333 times .744--from the first numerical example).

The present value of the benefit payments and administrative expenses was determined from the figures for 1957, 1960, and every fifth year thereafter up to 2050, after which the figures were assumed to remain constant, by applying the factors shown in Table 9. These factors are also used to obtain the present value of 1% of all future payrolls--by applying them to the estimated aggregate effective taxable payroll in the specified years, after adjustment for the lag in collecting the taxes (and, of course, moving the decimal point over two places). The present value of the benefit payments and administrative expenses divided by the present value of 1% of all future payrolls gives the level-premium cost of the benefit payments and administrative expenses.

The level-premium equivalent of the interest earnings on the existing Trust Fund is obtained by multiplying its amount by 3% to yield the annual interest earnings. This is then multiplied by the "perpetuity" factor of 33.333 to obtain the present value of this item, which is then divided by the present value of 1% of all future payrolls.

Table 9

FACTORS USED TO OBTAIN PRESENT VALUES OF OASDI BENEFIT PAYMENTS,  
ADMINISTRATIVE EXPENSES, CONTRIBUTIONS, AND PAYROLL, 3% INTEREST

<u>Year</u>	<u>Factor</u>	<u>Year</u>	<u>Factor</u>
1957	.9758	2005	1.2302
1960	3.6466	2010	1.0611
1965	4.0128	2015	.9154
1970	3.4615	2020	.7896
1975	2.9859	2025	.6811
1980	2.5757	2030	.5875
1985	2.2218	2035	.5068
1990	1.9165	2040	.4372
1995	1.6532	2045	.3771
2000	1.4261	2050	2.3677

Note: See text for explanation of how these factors are used. They incorporate discounting at 3% interest and straight-line interpolation to obtain estimates for intermediate years.



The present value of the tax receipts for a given contribution schedule must be obtained in a somewhat different manner since the figures do not move in a linear fashion between quinquennial years. It is not necessary, however, to obtain the present values of taxes by using the estimates for every individual future year. Rather, short-cut methods are available. For example, for the contribution schedule in the 1956 Amendments, estimated receipts were necessary only for each individual year up to 1980 and for every fifth year thereafter up to 2050. The present value of all future contributions was then obtained by applying the "regular" single-year discount figures for each year in the period 1958-79 and the "grouped" discount figures for 1980 and subsequent quinquennial years, shown in Table 9, except that a modified figure was used for 1980. By dividing the present value of the tax receipts by the present value of 1% of all future payroll, there is obtained the level-premium equivalent of the graded contribution schedule.

## P. Basic Techniques in Developing Contribution Schedules

The OASDI system has a financing basis such that it shall be completely self-supporting from the contributions paid by covered individuals and by employers of covered workers. By this is meant that over the long run the income to the Trust Funds from contributions and interest earnings on invested assets shall be sufficient to meet expenditures for benefit payments and administrative expenses. In most periods, the corpus of the Trust Funds will not be utilized as a primary source for meeting disbursements, but rather will serve the dual function of an interest-bearing asset and a fund to meet contingencies and fluctuations. As a result of the latter function, in certain years the Trust Funds themselves may be drawn upon to meet any excess of outgo over income arising. This can possibly occur during periods of business recession (when income may be relatively low and outgo may be relatively high) and in years just before the scheduled increases in contribution rates (when it is anticipated that even under high employment conditions the "lines" of income and outgo may cross).

This financing basis has been followed by the Congress certainly ever since the 1950 Amendments and also under the original 1935 Act and the 1939 Amendments. In the 1940's there was some modification of this basis, in theory if not in practice, by the introduction of a provision authorizing appropriations from general revenues. This latter provision was instituted at the time of one of the several "freezes" of the contribution rate, but was never utilized and was subsequently repealed by the 1950 Amendments.

This Section will first examine the procedure that the Congress would currently use in considering the financing of the program if it were to make any amendments--based on the procedures that have been followed in recent years--and then will show what was actually done in this respect in all previous legislation.

First, let us assume that the Congressional Committee concerned has decided on all the benefit and coverage provisions. Cost estimates are made to show the benefit disbursements in each calendar year in the future for both the low-cost and high-cost estimates--and likewise estimates of covered payroll for each future year. These are averaged to give the intermediate-cost estimate. The level-premium cost of the benefits and the administrative expenses according to the intermediate-cost estimate--expressed as a percentage of payroll--is next obtained. From the resulting figure there is subtracted the level-premium equivalent of the interest earnings on the existing Trust Fund.

The resulting net level-premium cost must be met by the level-premium equivalent of the scheduled contributions--or at least reasonably approximated thereby. Accordingly, the next step is to calculate the level contribution rate that is equivalent to the increasing schedule of rates in the existing law. If this equivalent level rate is considerably below the net level-premium cost of the disbursements, the Congressional Committee would--under this financing basis--increase the contribution schedule in some manner or other. Any existing actuarial "deficiency" or "surplus" in the system as it was before the legislative changes were considered would obviously be automatically taken into account by this procedure.

One method for obtaining an adequate contribution schedule is to provide a uniform increase in each future year. For instance, if the net level-premium cost of the disbursements were 7.5% of payroll and the level equivalent of the contribution schedule were 7.0%, an additional combined employer-employee contribution rate of  $\frac{1}{2}\%$  could be added to the schedule in every future year, and the system would then be in substantial actuarial balance.

Another procedure is to increase the ultimate scheduled rate. Thus, for example, under the conditions previously described, the ultimate rate that, under the 1958 Amendments, is in effect for 1969 and thereafter might be increased by about  $\frac{3}{4}\%$ , which would produce approximately the equivalent of a  $\frac{1}{2}\%$  level increase in all future years.

Still another method is to shorten the intervals at which the tax rate is increased, from the present 3 years to, say, 2 years. This last method can produce relatively little additional income as compared to the previous two methods, although it could, of course, be helpful in this connection if used in combination with one or both of them.

Under circumstances where the system is considerably out of actuarial balance, the Congressional Committee concerned, upon learning about this situation, would inquire as to possible ways of remedying the situation. Undoubtedly it would ask for several contribution schedules that would, more or less, restore the situation to actuarial balance.

Under the 1939 Amendments, all OASI contributions were automatically appropriated directly into the Trust Fund. During the period 1937-39, when the provisions of the 1935 Act applied, the actual financing provisions produced, in effect, this same result. In order to avoid certain questions of constitutionality, the 1935 Act provided for the annual appropriations to be under the concept of "an annual premium to provide for payments required under this title, such amount to be determined on a reserve basis in accordance with accepted actuarial principles." Thus, no relationship between the tax income and the appropriations was specified in the 1935 law.

However, in the original cost estimates, the appropriations were derived on the basis of the net proceeds of the taxes--i.e., after deducting from the total proceeds the estimated administrative expenses. Furthermore, in the actual operation of the law in 1937-39, this procedure was used. Accordingly, for purposes of the following discussion, it will be considered that the determination of the tax schedules has always been based on the procedure that the contribution collections would be appropriated directly to the Trust Fund.

In 1934-35, the Committee on Economic Security recommended an old-age benefit plan with appropriate financing arrangements. The combined employer-employee contribution rate was to be 1% for the first 5 years, rising by 1% every fifth year to a maximum rate of 5% (attained at the end of 20 years). There was also to be a Government subsidy that would be payable after the ultimate contribution rate had come into effect, and this would be solely for the purpose of preventing the fund from decreasing. This Government contribution, as it worked out, would begin about 5 years after the ultimate contribution rate went into effect and would eventually rise to a magnitude of about half of the combined employer-employee contributions. The contribution schedule was selected from several that were considered on the basis that it achieved the objectives of a low initial rate, a gradual rise spread over a long period of time, and an ultimate Government subsidy of about one-third of the total cost. The last objective was one of the basic financing recommendations made, irrespective of the benefit provisions.

The Congress, however, enacted considerably different provisions than the Committee on Economic Security recommended. The benefit provisions were altered materially, but more importantly the financing basis was drastically modified. It was decided that the system should be completely self-supporting or, in other words, that there should be no Government subsidy. In line with this, the combined employer-employee contribution rate started at a higher figure (2% instead of 1%), rose more rapidly (every 3 years instead of every 5 years), and reached a higher ultimate level (6% instead of 5%). Nonetheless, even with these changes, the system according to the legislation passed by the House of Representatives was estimated to be far from self-supporting. There was no indication what should be done about this situation if it should eventuate in actual experience.

The Senate, however, made a very important change in the original legislation for the old-age benefits system, namely, to provide that benefits should be payable only upon retirement. The House version of the bill had been silent on this matter, and thus benefits would have been paid automatically at age 65 regardless of retirement. The House bill had this basis not because of intent, but rather because of legislative drafting problems (that were finally handled in the Senate and then agreed to in conference by the House).

The question arose as to how to modify the cost estimates to take into account the introduction of the retirement test provision by the Senate. No experience was available to indicate the effect of this important factor. It was found that if benefit payments were estimated on the assumption of an average retirement age of  $67\frac{1}{2}$ , the system would be almost exactly in actuarial balance. This assumption was then adopted, not only because it seemed reasonable, but also because it had the advantage of showing the Congressional intent that the system should be self-supporting.

Although the 1939 Act very drastically changed the benefit provisions, these modifications were purposely made so as to keep the total overall cost within the same limit as the 1935 Act. This principle was followed both by the Executive Branch in planning the legislation and by the Congress in enacting it. The 1939 Act did, however, change the financing provisions slightly by freezing the initial 2% combined employer-employee tax rate for the 3-year period 1940-42, but it left otherwise unaltered the remainder of the schedule. In addition, the 1939 Amendments introduced provisions requiring the Board of Trustees to report when the Trust Fund became unduly small or when during the next 5 fiscal years its estimated size would exceed 3 times the highest annual disbursements anticipated during that period. The latter "3-times" rule was widely interpreted to mean that henceforth the Trust Fund would merely be a contingency fund, but there was no foundation for this belief because the provision was merely a "reporting" one and did not require that action should be taken to lower the future contribution schedule.

During the 1940's, the contribution rate continued to be frozen at its initial level, as a result of legislation in a number of years. In 1947, the legislation completely repealed the original schedule, which would have required a rate of 6% in 1949, and incorporated the following revised schedule: the initial 2% rate to be maintained through 1949, and then a 3% rate for 1950-51, and a 4% rate thereafter. Since the benefit provisions of the 1939 Act were still in effect, the cost of the program was much lower than it had been estimated to be initially; this was because of the weighted nature of the benefit formula, which was based on pre-war wage levels, whereas the past and future experience were on the much higher post-war levels. As a result, under this schedule the system was very close to being on a self-supporting basis.

The general thinking in the late 1940's, however, was that this was purely a temporizing matter since the benefit provisions would need adjustment. At such time, the contribution schedule could be re-examined. This procedure worked out quite well. In 1949, the Congress began the considerations of the program that resulted in the significant liberalizations of the 1950 Amendments. While in the midst of those

deliberations, by not taking action to "freeze" the tax rates, Congress deemed it advisable that the scheduled increase from 2% to 3%, provided in the 1947 legislation, should go into effect in 1950. Thus, the latter rate was eventually built into the contribution schedule as redesigned by the 1950 Amendments.

The technique for developing the future contribution schedule in the 1950 legislation was probably the most significant, insofar as at least as it indicates the procedure involved in connection with subsequent legislation. After considering the various benefit features desirable and their approximate costs, the House Ways and Means Committee made a final selection of desired provisions and asked for possible self-supporting contribution schedules with rates rising at 5-year intervals from the then-current employer-employee rate of 3% to an ultimate rate of 6% (the same as in the original legislation). Calculations indicated, however, that this was not possible because the cost of the desired changes required a somewhat higher ultimate rate than 6%. It was found that 1% increases approximately every 5 years would be satisfactory if the ultimate rate were 6½%, so that the following schedule was adopted: through 1953--3%; 1954-59--4%; 1960-64--5%; 1965-69--6%; and 1970 and thereafter--6½%. The increases in the schedule occur at 5-year intervals, except that the first one was placed in 1954 instead of 1955; this was done in order to prevent the first increase from becoming a possible issue in the 1954 political campaign.

The 1952 legislation liberalized the benefit provisions moderately--as compared with the much greater liberalizations in the 1950 Amendments. No change was made in the financing provisions since revised cost estimates indicated that the additional cost could be met by the reduction in cost shown as a result of the higher earnings rates and the higher interest rates in the period since the 1950 Amendments were first considered.

When the 1954 Amendments were under consideration, new cost estimates had been made for the system as it was following the 1952 Amendments. The presence of a small, but significant, actuarial deficiency was observed. In addition, the liberalizations of the 1954 Amendments added further cost items. In order to recognize both of these elements, the House Ways and Means Committee raised the future contribution rates without changing those in the earlier years--by increasing the 6½% rate for 1970 and thereafter to 7% for 1970-74, and 8% for 1975 and thereafter.

In 1956, there were certain small liberalizations in the benefit provisions of the OASI system that, on the whole, were met without changing the contribution schedule. Rather, to all intents and purposes, according to the cost estimates made, the increases in cost of the new OASI benefit provisions were met by (1) a higher interest basis for the

investments of the Trust Fund, (2) somewhat higher earnings assumptions being used in the cost estimates so as to reflect actual recent experience, and (3) certain reductions in cost arising from the extension of coverage made by legislation enacted that year (primarily, to the uniformed services). The House version of the bill contained somewhat more costly OASI benefit features than the final legislation, and the additional cost therefor was met by a uniform increase in the combined employer-employee contribution rate of  $\frac{1}{2}\%$  in all future years; this was sufficient to keep the system in actuarial balance, but was eliminated by the Senate at the same time the corresponding benefit provisions were eliminated or reduced in liberality.

The 1956 legislation also established a system of monthly disability benefits, with a separate Trust Fund. The cost therefore was met by adding a level combined employer-employee contribution rate of  $\frac{1}{2}\%$  to the previously existing contribution schedule. This  $\frac{1}{2}\%$  rate was a close approximation of the level-premium cost of the disability benefits, according to the intermediate-cost estimate. In fact, a small "actuarial surplus" was indicated.

The relatively small deficiency shown in the original estimate for the 1956 Amendments was substantially increased according to cost estimates subsequently made. These estimates represented a complete overhauling of the earlier estimates, making different assumptions based on further experience and also modifying extensively the methodology (see Actuarial Study No. 48). The actuarial deficiency or lack of balance of the OASI portion of the system increased sharply, largely because of assuming higher retirement rates--as a result of considering recent experience--and somewhat lower future mortality, more than offsetting the higher earnings assumptions. On the other hand, the "surplus" in the DI portion of the system increased moderately because of taking into account, from actual experience, the effect of the offset provision, which was eliminated in the 1958 Amendments.

Because of the considerably increased actuarial deficiency of the combined OASDI system, one of the stated major purposes in the bill revising the program in 1958 was "to improve the actuarial status of the Trust Funds." This was accomplished not only by the changes in the contribution schedule as it relates to the OASI portion of the program (by an increase of  $\frac{1}{2}\%$  in the combined employer-employee rate in all future years and by changing the interval of future rate increases from 5 years to 3 years), but also by the increase in the earning base (the latter change was primarily made to reflect changes in the general earnings level since 1954). The Congressional debate on the legislation very strongly emphasized the necessity for improving the actuarial status of the system and the fact that this would be done by the bill under consideration. The statement was made that if the actuarial balance of the system were within  $\frac{1}{4}\%$  of

payroll--considering the range of error present in long-range cost estimates and, of course, the possibility of future Congressional consideration--the system could be said to be in approximate actuarial balance. As indicated hereafter, this condition was satisfied by the 1958 Amendments.

The 1958 legislation also contained features that increase costs, but these are more than offset by the changes involving increased income. Thus, for the OASI portion of the system, the increase in the contribution schedule combined with the net effect of increasing the earnings base (after allowing for the increased benefits arising therefrom) produced additional income having a level-premium equivalent of .91% of payroll. The additional cost for the 7% increase in benefits was .57% of payroll, and the increased cost for the other OASI liberalizations was .02%, so that the net "surplus" available for reducing the deficiency under the 1956 Act amounted to .32%. Thus, the deficiency for the OASI portion of the system, according to the intermediate-cost estimate, was reduced to .25% of payroll.

In the DI portion of the system, benefit costs were increased by the 1958 Amendments by (a) .03% of payroll for the 7% increase in benefits, (b) .06% for the dependents benefits added, (c) .03% for the elimination of the offset provision, and (d) .03% for the modification of the insured status requirements. The total gross increase in benefit cost was thus .15% of payroll. This was reduced by .01%, the net effect of increasing the earnings base, leaving a net additional cost of .14% of payroll. Accordingly, the "surplus" of the DI portion of the system, according to the intermediate-cost estimate, was reduced to only .01% of payroll.



## Q. Preparation of Cost Estimates for 1958 Amendments

The actuarial cost estimates for the 1958 Amendments were developed by making certain shortcuts and approximations on the detailed cost estimates for the OASDI system as it was after the enactment of the 1956 Amendments.

First, the cost estimates were developed on the basis that the only change would be to raise the maximum earnings base from \$4200 to \$4800. From studies of actual earnings distributions, it was estimated that the total taxable payroll would be increased 6% by such a change. The effect on benefit disbursements would, however, be significantly less than this because of the weighted nature of the benefit formula. There would be even more of an effect in the early years of operation since no "new start" provision was assumed, and thus earnings between \$4200 and \$4800 would not be credited for past years. Approximations were made of the effect on benefit disbursements of increasing the earnings base by considering various typical individual cases. These increases, graded downward somewhat for the earlier years, were then applied to the benefit disbursements.

The next step was to consider the effect of the other changes. As to the OASI portion of the system, it was assumed that benefit disbursements would be increased (a) by 7.2% as a result of the combined effect of the general 7% benefit increase, with a somewhat higher increase for the smallest benefits, and the 27% increase in the maximum family benefit and (b) by .25% to allow for the liberalizations in the retirement test (by increasing from \$80 to \$100 the amount of wages that can be earned in a month without preventing payment of full benefits for that month, regardless of annual earnings, if there is no substantial self-employment in that month), and in the parent's benefit provisions (providing such benefits in all cases, rather than only when there are no other survivors who can ever be entitled to monthly benefits).

As to the DI portion of the system, the following changes were made:

1. Elimination of the adjustment of .03% of payroll to allow for the provision formerly in the law under which other disability benefits were offset against DI benefits.
2. An increase of 7.2% in total benefit disbursements due to the general benefit increase.
3. An increase of 10% to allow for the elimination of the requirement of currently insured status (an arbitrary judgment, but one borne out by a subsequent study showing that this figure should be 7% for men and 18% for women, or 10% in the aggregate).

4. An increase of 14% to allow for the introduction of dependent's benefits (based on analysis of the proportion of disability benefit applicants who indicated having children and considering especially the effect of the family maximum benefit provision).

The last three adjustments were applied on a product basis since each was deemed to be dependent on the others. Accordingly, the aggregate increase for these three adjustments was 34.4%.

Actuarial Studies Available from the Division of the Actuary\*

10. Various Methods of Financing Old-Age Pension Plans--September 1938.
14. An Analysis of the Benefits and Costs under Title II of the Social Security Act Amendments of 1939--December 1941.
16. Estimated Amount of Life Insurance Value in Force under Survivors Benefits of the Old-Age and Survivors Insurance System--January 1941.
17. New Cost Estimates for the OASI System, with the Assumption of a Static Future Wage Level--December 1942.
19. OASI 1943-44 Cost Studies--May 1944.
21. Analysis of Long-Range Cost Factors--September 1946.
22. Cost Study for Complete Coverage Program of Old-Age, Survivors, and Disability Insurance--August 1945.
23. Long-Range Cost Estimates for OASI, 1946--April 1947.
26. Present Values of OASI Benefits Awarded and in Current Payment Status, 1940-46--May 1948.
28. Long-Range Cost Estimates for Expanded Coverage and Liberalized Benefits Proposed to the OASI System by H.R. 2893--February 1949.
29. Estimated Amount of Life Insurance in Force as Survivor Benefits under OASI System--April 1949.
30. Analysis of the Benefits under Title II of the Social Security Act Amendments of 1950--February 1951.
31. Estimated Amount of Life Insurance in Force as Survivor Benefits under Social Security Act Amendments of 1950--September 1951.
32. Analysis of 346 Group Annuities Underwritten in 1946-50--October 1952.
33. Illustrative U.S. Population Projections, 1952--November 1952.
34. Analysis of the Benefits under the OASI Program as Amended in 1952--December 1952.

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\* Numbers not listed are out of print.

35. Present Values of OASI Benefits in Current Payment Status 1940-52--May 1953.
36. Long-Range Cost Estimates for OASI 1953--June 1953.
37. Estimated Amount of Life Insurance in Force as Survivor Benefits under Social Security Act Amendments of 1952--August 1953.
38. Long-Range Cost Estimates for Changes Proposed in the OASI System by H.R. 7199, with Supplementary Estimates for Universal Coverage--March 1954.
39. Long-Range Cost Estimates for OASI 1954--December 1954.
40. The Financial Principle of Self-Support in the OASI System--April 1955.
41. Analysis of Benefits, OASI Program, 1954 Amendments--May 1955.
42. Present Values of OASI Benefits in Current Payment Status 1940-54--July 1955.
43. Estimated Amount of Life Insurance in Force as Survivor Benefits under OASI--1955--September 1955.
44. Analysis of 157 Group Annuity Plans Amended in 1950-54--July 1956.
45. Present Values of OASI Benefits in Current Payment Status 1940-56--May 1957.
46. Illustrative United States Population Projections--May 1957.
47. Estimated Amount of Life Insurance in Force as Survivor Benefits under OASI--1957--July 1958.
48. Long-Range Cost Estimates for Old-Age, Survivors, and Disability Insurance under 1956 Amendments--August 1958.
49. Methodology Involved in Developing Long-Range Cost Estimates for the Old-Age, Survivors, and Disability Insurance System--May 1959.

Appendix I. Principles Underlying the Financing of the Old-Age, Survivors, and Disability Insurance Program

Review of pertinent statutes, reports, and actual practice indicates that the method of financing the benefit payments and administrative expenses of the Old-Age, Survivors, and Disability Insurance system rests on certain basic principles and objectives, which have been stated in various official reports. Among the earliest of these to be formulated are the following<sup>1/</sup>:

(1) Contributions as Primary Source of Financing System.

Covered employees and their employers are required to contribute a scheduled percentage of the covered wage of the individual workers (according to the 1958 Amendments, 2 $\frac{1}{4}$ % in calendar year 1959 for Old-Age and Survivors Insurance, with scheduled increases of  $\frac{1}{2}$ % in 1960 and each third year thereafter, to a maximum of 4 $\frac{1}{4}$ % in 1969 and subsequent years, and  $\frac{1}{4}$ % in all future years for Disability Insurance). Covered self-employed persons are required to contribute a scheduled percentage of covered self-employment earnings (1 $\frac{1}{2}$  times the employee contribution rate). ".... a contributory basis facilitates the financing of a social-insurance scheme and is a safeguard against excessive liberalization of benefits as well as a protection against reduction of benefits." (page 6).

The recommendations of the Advisory Council of 1938 included proposals for future contributions to the program out of general tax revenues. From 1943 to 1950, the Social Security Act included an authorization (never used) for a Federal subsidy to help finance the cost of benefits. The 1948 Advisory Council reiterated this recommendation. In 1950, however, Congress adopted the policy that the program should be financed solely from worker and employer contributions. In its report on the Social Security Amendments of 1950<sup>2/</sup>, the Senate Committee on Finance said:

".... your committee is of the belief that the old-age and survivors insurance program should be on a completely self-supporting basis. Accordingly, the committee-approved bill, just as the House-approved bill, eliminates the provision added in 1943

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<sup>1/</sup> The reference in Item (1) is from "Social Security Act Amendments of 1939" (House Report No. 728, 76th Congress). References in subsequent Items (page I-2) are from "Final Report to the Senate Committee on Finance of the Advisory Council on Social Security" (Senate Document No. 4, 76th Congress, December 10, 1938).

<sup>2/</sup> "Social Security Act Amendments of 1950" (Senate Report No. 1669, 81st Congress, May 17, 1950), pp. 33-54.

authorizing appropriations to the program from general revenue. At the same time, your committee has recommended a tax schedule which it believes will make the system self-supporting as nearly as can be foreseen under present circumstances."

This principle of "self-support" has been adhered to by Congress in all amendments to the program adopted since 1950.

(2) Need for at least a Contingency Fund. The financing basis of the program should embody "provision for a contingency fund to insure ready payment of benefits at all stages of the business cycle and under varying conditions resulting from fluctuations in such factors as the average age of retirement, the total coverage under the program, and average wage rates. It is desirable that the payment of benefits should not be dependent upon quick congressional action in levying emergency taxes to meet deficits or in sudden raising of contribution rates when disbursements exceed current tax collections." (page 25)

(3) Long-Range Financial Planning. "The planning ... must take full account of the fact that, while disbursements for benefits are relatively small in the early years of the program, far larger total disbursements are inevitable in the future. No benefits should be promised or implied which cannot be safely financed not only in the early years of the program but when workers now young will be old." (page 25)

(4) Need for Long-Range Actuarial Cost Analysis. "Sound presentation of the Government's financial position requires full recognition of the obligations implied in the entire old-age security program and Treasury reports should annually estimate the load of future benefits and the probable product of the associated tax program." (pages 25-26)

(5) Necessity of Recognizing Dynamic Nature of System.  
" ... the problem of financing ... old age and survivors insurance ... must be approached as a part of the general fiscal problem of the government in providing for a continuing social service mechanism. In planning financial policy, conservatism is a necessity but at the same time flexibility is vital. In a continuing social insurance program, the cost of future benefits can only be estimated. The source of future income can likewise only be estimated. Frequent revaluations of future costs and future income are essential to the safe planning of the system." (page 23)

These principles and objectives were developed at least 20 years ago. They were the result of intensive studies, discussions, and debates--inside and outside the halls of Congress--in regard to the financing and benefit provisions of the Social Security Act during the time it was being considered and shortly after it was originally enacted in 1935.

The original benefit and financing provisions were apparently influenced to a large extent by practices that are essential or desirable in the voluntary insurance and annuity business. The original benefit formula leaned heavily on the "equity" concept of orthodox voluntary insurance practice. Thus, it has been stated: "But it was almost immediately obvious that strict attention to these ideas of equity limited most seriously what could be done in developing the social value of the plan, and, after all, this was the purpose of its creation," and "Gradually it was recognized that the social values sought must prevail over ideas of individual equity and also that there are essential differences between the budgeting problems of a nation and those of an individual."<sup>3/</sup>

The issues of underlying philosophy for an old-age benefit formula under the social insurance approach has been summed up in the expression "individual equity versus social adequacy." It was generally recognized that individual equity is of paramount importance in administering voluntary old-age insurance on a sound financial basis since each individual has the right to purchase insurance or not as he wishes. However, under a governmental social insurance plan, individual equity in the relationship of the individual's future benefit to his current contribution is not essential to financial soundness, since the individual has no choice as to being covered or as to his rate of benefits or contributions.

The issue was resolved in the 1939 Amendments by a major change in emphasis, as a result of which the old-age benefit formula is based largely on the adequacy concept--and thus to only a small extent on the equity concept. While there continues to be, and probably always will be, differences of opinion as to the precise weights to be given to adequacy and to equity, there seems to be widespread agreement that adequacy should receive much more weight than equity.

This basic shift in benefit philosophy was accomplished in the 1939 Amendments without much controversy, and a further move in this direction was made in the 1950 Amendments (and, to some extent,

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<sup>3/</sup> "Issues in Social Security--A Report to the Committee on Ways and Means of the House of Representatives by the Committee's Social Security Technical Staff," January 17, 1946, pages 104-105.

in subsequent Amendments). However, as to financing, there was great controversy in the late 1930's, and there still seems to be some misunderstanding.

In the debates on financing at the time of the 1939 Amendments, there was frequent reference to the issue of "pay-as-you-go" versus "full reserve." In its simple form, "pay-as-you-go" contemplates that only enough funds would be raised currently to cover the current outlay for benefit payments and administrative expenses. The "full reserve" basis contemplates the accumulation, during an initial period, of very substantial funds which would be available to discharge existing liabilities if the old-age plan were to cease operating. Such existing liabilities include both those to the current beneficiaries, and those accrued to date with respect to current contributors.<sup>4/</sup> The concept of "full reserve" is often used for private pension plans.

Neither the "pay-as-you-go" nor the "full reserve" concept in these extreme forms has ever been accepted by Congress. There has always been recognition of the need for at least a contingency reserve. As the result of intensive study of the many implications of the "full reserve" concept, it became apparent that many of the reasons why private pension plans often use the "full reserve" basis are not applicable to a national compulsory contributory old-age plan of the type established by the Social Security Act. The essential security of this plan rests, in the final analysis, upon the taxing power of the United States Government and the willingness of the people to have it exercised. Hence, it has been recognized that the degree of reserve financing desirable for the old-age social-insurance plan depends primarily on practical considerations peculiar to that plan, and not on the actuarial considerations often used for private pension plans.

General agreement on the financing method to be used was greatly facilitated by the change in the benefit formula and the other benefit provisions--first instituted in the 1939 Amendments and then extended in the 1950 and subsequent Amendments--from a predominantly equity approach to a predominantly adequacy approach. The issue has been resolved by the adoption of what has been referred to as a "limited reserve" basis. This approach contemplates the accumulation of a fund of modest amount for the following purposes:

(1) To permit the enactment of a schedule of contribution rates that need not be changed except at predetermined intervals, such as the 3-year periods under the present statutory provisions. The fund makes it possible to avoid the necessity of varying the contribution rate each year, or even more frequently, with resulting sudden breaks in the schedule.

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<sup>4/</sup> It is usually more difficult to determine the latter liabilities in social insurance than in voluntary insurance and annuity plans on a contractual basis.



(2) To permit future changes in contribution rates on a gradual basis, rather than on a sharp, unpredictable basis. Although there is no need to have a specific schedule of contribution rates appear irrevocable, it would be unfortunate if the schedule became a matter of annual contention.

(3) To act as a buffer over a short period of years for the discrepancies that are almost certain to occur between the actual financial experience (income and outgo) and the estimates considered by Congress in setting the contribution rates.

(4) To act as a financial stabilizer over the swings of a business cycle by providing a reservoir into which any current excess of income over outgo may be accumulated--to be drawn on during times when outgo exceeds income. In a period of economic recession, the presence of such a fund enables the level of benefits to be maintained without increase in current contribution rates, even though the recession results in a current decline in the taxable payroll and in acceleration in benefit outgo (particularly by reason of more retirements from the labor force).

(5) To provide additional current income through the interest that is earned. This investment income permits the use of a contribution schedule for future years at a somewhat lower level than if no fund were accumulated. It is also helpful during a period in which benefit outgo temporarily exceeds contribution income.

(6) To bring together in a single financial account the composite effect of variations in each year's actual experience for the component factors used in the cost estimates. If the financial results indicate important variations, this should motivate prompt analysis to determine whether one or more of the factors is undergoing secular changes, which might necessitate revision of the estimates of future income or outgo and perhaps reconsideration of the benefit or cost provisions.

The vehicle for the accumulation and application of the "limited reserve" basis for Old-Age and Survivors Insurance is the Federal Old-Age and Survivors Insurance Trust Fund. A similar trust fund has been created for the Disability Insurance program. To these trust funds are credited the contributions paid by employees, employers, and self-employed and the interest earnings on the funds. Against them are charged the payments to beneficiaries and the administrative expenses. The balances in the trust funds are the "limited reserves" being held for the program.

Some of the short-range and long-range purposes of the trust funds, listed earlier, are effected through the following statutory responsibilities of the Board of Trustees:

(1) To report annually on the operation and status of the trust funds during the preceding fiscal year and on their expected operation and status during the next ensuing 5 fiscal years.

(2) To report immediately to the Congress whenever the Board is of the opinion that the amount of either of the trust funds is unduly small.

(3) To furnish a statement of the actuarial status of the trust funds. In actual practice, the Board has presented the most up-to-date appraisal, in the light of completed actual experience and projected future experience, of the adequacy of the contribution schedule to provide the necessary income to finance present and future benefits.

It is clear from the statutory provisions and the annual reports of the Board of Trustees that the financing method contained in the law and the actuarial cost estimating procedures followed are consistent with the following observations made in the report of the 1948 Advisory Council on Social Security to the Senate Finance Committee<sup>5/</sup> (headings supplied):

- (a) Need for Graded, Adequate Contribution Schedule.  
"Particular attention has been given to the problem of financing the program. The recommendations regarding the contribution rates recognize the need for a rate which is high enough to establish a reasonable relationship between contributions and benefits and which will increase gradually to the full amount necessary to support the future program, but not so large as to build up excessive amounts in the trust fund in the early years." (page xi)
- (b) Factors Involved in Size of Trust Funds.  
"The increase in the trust fund is an incidental result of the contribution rates, the benefit rates, and the eligibility requirements that seem to us desirable on other grounds. Unlike private insurance, a social-insurance scheme backed by the taxing power of the Government does not need full reserves sufficient to cover all liabilities." (page 46)
- (c) Relationship of Benefit Disbursements and Contributions in Early Years.  
"Under a contributory system of old-age and survivors insurance, however, qualifying requirements - even though

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<sup>5/</sup> "Recommendations for Social Security Legislation," the Reports of the Advisory Council on Social Security to the Senate Committee on Finance (Senate Document No. 208, 80th Congress, December 31, 1948).

liberal - unavoidably result in lower benefit disbursements in the early years of operation than in the later years. If contributions in the early years were no more than sufficient to cover disbursements, they would be so small in relation to benefit rights currently being established that the system could scarcely be called contributory.....The contributory nature of the system, therefore, inevitably develops at least a limited reserve." (page 48)

(d) Difficulties Involved in Cost Estimates.

"The Council, however, would be less than frank if it failed to stress the difficulties of estimating the ultimate cost of the system." (page 11)

(e) Factors Involved in Cost Estimates.

"Exactly what future costs will be will depend on a number of factors that are more or less uncertain - the proportion of men and women in covered employment who will reach the age of retirement, the proportion of persons reaching the age of retirement who will have fully insured status, the proportion of persons eligible for benefits who will elect to work rather than retire, and the length of time retired persons will draw benefits. Similar questions arise in connection with survivorship benefits." (page 11)

(f) Effect of Rising Earnings on Cost Estimates.

"If past trends continue, monthly wage earnings several decades hence will be considerably larger than those of today, and benefits will probably be revised to take these increased wages into account. The long-range estimates presented by the Council, however, disregard the possibility of increases in wage levels and state the costs of the proposed benefits as a percentage of the pay rolls based on continuation of the wage levels of the last few years. If increasing wage levels had been assumed, the costs of these benefits as a percentage of pay rolls would be lower than those presented. Use of the level-wage assumption, therefore, has the effect of allowing for liberalizations of benefits to keep pace with any increases in wages and pay rolls which may occur. If wages continue to rise and such liberalizations are not made, these estimates overstate the cost as a percentage of payroll and a contribution rate based on them would be too high." (page 11)

(g) Significance of Percentage-of-Payroll Cost Figures.

"The percentage-of-payroll figures are the most important measure of the financial effort required to support the system and are the basis for determining

ultimate contribution rates. Dollar figures taken alone are misleading. For example, extending coverage to groups now excluded would greatly increase the dollar costs because more people would become eligible for benefits, but as indicated earlier it will actually decrease the cost as a percentage of pay roll." (page 11)

The most recent formulation of the principles on which the financial provisions of the program are based was made by the 1958 Advisory Council on Social Security Financing. Its report<sup>6/</sup> included the following statements:

- (a) "The fact that the worker pays a substantial share of the cost of the benefits provided, in a way visible to all, is his assurance that he and his dependents will receive the scheduled benefits and that they will be paid as a matter of right without the necessity of establishing need...The Council also believes that the direct earmarked tax on prospective beneficiaries promotes a sense of financial responsibility. It is very important that people see clearly that increases in protection necessarily involve increases in costs and contributions." (page 62).
- (b) "Protecting the members of the labor force and their dependents against loss of income from the hazards of old-age retirement, permanent and total disability, and death is, at least in part, a proper charge on the cost of production. Moreover, business enterprises have a significant stake in assuring that orderly provision is made to meet the needs of their employees and their families for income when their working lives are over. The earmarked contributions for social security is a recognition of this stake." (page 63)
- (c) "The Council approves of the accumulation of funds that are more than sufficient to meet all foreseeable short-range contingencies, and that will therefore earn interest in somewhat larger amounts than would be earned if the funds served only a contingency purpose. The Council concludes, however, that a 'full' reserve is unnecessary and does not believe that interest earnings should be expected to meet a major part of the long-range benefit costs." (page 67)

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<sup>6/</sup> "Nineteenth Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance Trust Fund and the Federal Disability Insurance Trust Fund," House Document No. 181, 86th Congress (pages 56-73).

(d) "In a national compulsory social insurance program it can properly be assumed that the program will continue to collect contributions and to pay benefits indefinitely into the future. The old-age, survivors, and disability insurance program therefore does not need a full reserve. It may be considered to be in actuarial balance when estimated future income from contributions and from interest on the investments of the accumulated trust funds will, over the long run, support the estimated disbursements for benefits and administrative expenses."  
(page 68)

(e) "Although the Old-Age and Survivors Insurance Trust Fund will be only a fraction of the 'full reserve,' ...it will grow to a considerable size and play a significant role as an interest-earning fund...If benefits are adjusted upward as earnings levels rise, then the interest earnings on a fund of any given size will meet a decreasing proportion of benefit costs. In the light of potential increase in earnings and benefits as decades pass, we believe it unwise to count on interest to meet a major part of the costs of the program in the far-distant future." (page 63)

The principles upon which to base the financing of old-age and related benefits in a social insurance system have been discussed at great length both in this country and abroad. However, nowhere have as many leaders in as many fields participated in the discussions as in this country. They include recognized authorities in many professions, legislators, government officials, journalists, labor leaders, spokesmen for large and small business, and officials of farm organizations. Many individuals have also been active in the discussions--workers, businessmen, professional men, farmers, housewives, clergy, graduate and undergraduate students, social workers, etc.

This debate was especially active early in the development of our old-age insurance system, when the size of the fund to be accumulated was a burning question. As is often the case in this country, the answer was arrived at through a pragmatic political process rather than through a theoretical philosophical process. And, as is also often the case, the pragmatic process has resulted in an answer which, to date at least, has worked out satisfactorily. Just as the benefit formula is a blend of equity and adequacy, with much greater emphasis on the latter, so is the financing method a blend of "reserve" and "pay-as-you-go," with the latter having the greater weight. Both of these blends, with the weight shifted to "adequacy"

and "pay-as-you-go", respectively, were inherent in the 1939 Amendments and have met the very severe tests to which they have been subjected in the unprecedented conditions of the last 20 years.

The financing method has functioned satisfactorily to date because the legislative and the executive branches of our government have been keenly aware that, from the very nature of social insurance and because of the dynamic character of our society and our economy, constant vigilance is necessary to keep the program sound. To accomplish that, it is recognized that limited reserves--neither excessive nor insufficient--are essential as a financial tool, so to speak, to be employed judiciously when other aspects of the plan, or the social or economic environment, make this advisable.

Both Congress and the Board of Trustees also realize that the long-range forecasts of income and disbursements--expressed either in dollars or as percents of covered payroll--are based on a number of factors that, themselves, are subject to varying degrees of uncertainty. This uncertainty has been recognized by adoption of the practice of making two sets of long-range forecasts as discussed in the main text of this Actuarial Study. But of equal, if not greater, importance is the recognition that this practice needs to be coupled with a policy of continuously re-examining the underlying assumptions for the long-range actuarial estimates. This is necessary since important secular, as contrasted with cyclical, changes can and often do take place in demographic and economic factors.

Another advantage of the limited reserve method appears if and when revised long-range estimates indicate the desirability of changes in the statutory contribution rates. On such occasions, the availability of a fund gives more flexibility in deciding the timing and the grading of the changes.

Summing up, the present method of limited reserve financing, which is a blend of pay-as-you-go and full reserve, would appear to be the most appropriate and practical for the Old-Age, Survivors, and Disability Insurance system. However, continued successful operation of the plan requires not only annual appraisal of the operating results, but also re-examination at regular intervals of the techniques and assumptions for the long-range estimates. Such periodic re-examinations should be made by both the Board of Trustees and Advisory Councils authorized by Congress.

Appendix II. Summary of Basic Procedures Used in Reviewing or Revising the Old-Age and Survivors Insurance Schedule of Contribution Rates

As described in Appendix I, the financing method used for Old-Age and Survivors Insurance is a blend of "pay-as-you-go" and "reserve" that contemplates an initial schedule of contribution rates with increases at a regular interval for a number of years. This schedule will provide income greater than disbursements in the early years, so that a fund will be accumulated for the purposes listed in Appendix I. The schedule is subject to review from time to time to determine whether it should be revised to take account of actual experience and of any modifications deemed appropriate in the assumptions used in forecasting future experience. A similar review to determine the necessity for revision is also undertaken when important amendments in the benefit or other provisions of the plan are under consideration.

The current and future scheduled contribution rates, expressed as a percentage of taxable wages for employees and employers, are the same in any given year for all employees, irrespective of age, sex, or marital status, and for all employers. For the self-employed, the contribution rate of  $1\frac{1}{2}$  times the employee rate is applied to the taxable self-employment income.

The first step in reviewing the schedule of contribution rates is to forecast the annual disbursements for benefits and administrative expenses for many decades in the future. This is done by the "open group" technique. This means that, for a period starting with a specified date, future disbursements are estimated not only for those who are covered at the beginning of the period, but also for those who became covered for the first time at a later date.

To estimate benefit disbursements in a given future year, estimates for that year are needed in respect to various elements such as the following:

- Population subdivided by age and sex;
- Proportion of population in covered employment by age and sex;
- Number of persons in insured status by age and sex;
- Number of beneficiaries divided by classes (primary dependents, and survivors);
- Average annual earnings;
- Average benefit rate for each class of beneficiaries.

The assumptions used for determining various demographic, economic, and other factors used in making those estimates are referred to in the body of this Actuarial Study. Two values or tables are calculated for some of the factors because of the range possible in making

reasonable assumptions therefor. That procedure in turn permits two sets of estimates of benefit disbursements--one based on a combination of factors tending toward low costs, and the other based on a combination of factors tending toward high costs.

The next step is to convert data on yearly disbursements into percentages of the yearly taxable payrolls. That requires estimating taxable payrolls by years, on both "low-cost" and "high-cost" combinations of pertinent factors. The two resulting series of yearly disbursements as percentages of payroll indicate the estimated yearly contribution rates on the "low-cost" and "high-cost" bases if the financing were done solely on the pay-as-you-go basis.

The third step is the review of the statutory schedule of contribution rates to determine whether revision is necessary for maintenance of actuarial balance. For this purpose, the "low-cost" and "high-cost" yearly estimates of disbursements and taxable payrolls are averaged--the resulting figures being referred to as "intermediate-cost" estimates. From these figures are computed the theoretical "pay-as-you-go" contribution rates.

An actuarial bench mark is next computed to compare potential income over the years from the theoretical "pay-as-you-go" contribution schedule with the income from the actual statutory graded schedule and the interest earned by the trust fund as it is expected to develop. Three calculations are involved. The first is a computation, based on intermediate-cost estimates, of the level-premium cost of benefits and administrative expenses--expressed as a percentage of taxable payroll. The level-premium cost is the percentage of covered payroll that, if charged from now on indefinitely, would produce enough contributions and interest income to the fund to meet the cost of benefit payments and administrative expenses.

Inherent in the level-premium cost concept is the assumption that the net effect of actual experience with the various factors used for the cost estimates will be such that intermediate-cost estimates will be realized in actual operation, and that the interest earnings of the trust fund will be at the interest rate or rates used in the level-premium calculation. Obviously, it is most unlikely that actual experience will conform to such assumptions; nevertheless, the level-premium cost bench mark remains one of the best measures for reviewing and revising the schedule of contribution rates.

The second calculation involves adjustment of the level-premium cost by subtracting the level-premium equivalent of the interest earnings on the amount in the trust fund as of the date of calculation. This means computing the level-premium equivalent, as a percentage of payroll, of the fixed amount payable each year into perpetuity that represents the interest earnings of the existing trust fund at the interest rate or rates assumed in the actuarial calculations.



Since the currently accepted financial basis of the Old-Age, Survivors, and Disability Insurance system is that it be completely self-supporting from contributions paid by covered individuals and covered employers, the resulting net level-premium cost must be met, or at least reasonably approximated by the scheduled contributions. Accordingly, the third calculation is to compute the level-premium equivalent of the contribution rates, which is the percentage of covered payroll that, if charged from now on indefinitely, would produce the same amount of income to the fund over the long-range future as would be produced by the graded schedule of contribution rates in the existing law. If this level-premium equivalent of the contribution rates differs considerably from the net level-premium cost of the disbursements, adherence to the present financing basis for Old-Age, Survivors, and Disability Insurance requires a compensating increase or decrease in the contribution schedule. This procedure would, of course, take into account any actuarial "deficiency" or "surplus" in the existing system.

Following are a few simple illustrations of how the contribution schedule may be increased or decreased so that its level-premium equivalent may be in reasonable balance with the net level-premium cost:

(1) An increase or decrease of the same percentage in the contribution rates for all future years--e.g., all rates in the schedules may be increased by adding .25 percent (.375 percent from the self-employed), as was done in the 1958 Amendments.

(2) A change in the intervals at which the tax rate is increased--e.g., a 5-year interval may be reduced to 3 years, the change made by the 1958 Amendments.

(3) An increase or decrease in the ultimate tax rates in an otherwise unchanged schedule--e.g., the ultimate rate (4.5 percent each for employers and employees and 6.75 percent for self-employed) now in effect for 1969 and thereafter may be increased by .5 percent and .75 percent, respectively, to be effective from 1972 on.

Combinations of the above methods can also be used. Alternative ways to bring the contribution schedule and the net level-premium cost into actuarial balance are to change the benefit provisions instead of the contribution schedule or to change both the benefits and the contribution schedule.