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4. The Basic Set of Projections of Fund Levels

This chapter considers one set of projections of the level of the funds of private industrial pension plans. This set, P_1, may be called the "basic" set, because its projections provide the single best estimator of the trend of pension funds over the next twenty years. (However, no one set of projections is likely to cover all aspects of the possible behavior of pension funds; therefore, in a later chapter other projections are developed.)

Consideration of the specific assumptions of Chapters 2 and 3 makes it clear that there has already been a proliferation of projections, despite the constraint on multiplication of projections imposed by the choice for this basic set of a single P/B and a single C/W from among several possible candidates for each. For coverage, C_j, there are four possible states; for the adjustment factor, A_i, five different possibilities; and for interest rates or fund earnings, r_k, four choices: 3.5 per cent, 4.0 per cent, 4.5 per cent, or projecting $C + E$ by extension of a trend. Hence the product of all the possible states of the A_i, C_j, and r_k is eighty.

As the last two chapters have shown, equal credence should not be accorded all eight of these projections of the basic set. Earlier the grounds were established for preferring $A_{.25}$ and $A_{.50}$ of the A_i and C_3 of the C_j. It is also interesting to examine C_1, since it is derived differently from C_2, C_3, and C_4, all three of which belong to a class. And, as explained above, to take $r = 4.0$ per cent is a reasonable step. In addition, there seemed no basis on which to choose between an interest rate assumption and projecting contributions plus earnings as a combined total. These combinations of assumptions determine eight projections as the most likely group in the set of eighty. The following succinct descriptions are used.

Adjustment factor, A_i, can take on specific designations A_0, $A_{.25}$, $A_{.50}$, $A_{.75}$, A_1.

Coverage projection, C_j, can take on specific designations C_1, C_2, C_3, C_4.

Earnings assumptions, designated r_k, can take on values of 3.5 per cent, 4.0 per cent, 4.5 per cent, or $C + E$ (which stands for contributions plus earnings projected by extending a trend, as described earlier).

Since P/B and C/W have been projected under only one assumption each, they need not be specifically noted. Then each projection in the basic set can be designated by a triple of letters and numbers. To illustrate, the projections chosen as the most likely group can be described as:

$$(A_{.25},\ C_1,\ 4.0)$$

$$(A_{.25},\ C_1,\ C + E)$$

$$(A_{.25},\ C_3,\ 4.0)$$

$$(A_{.25},\ C_3,\ C + E)$$

$$(A_{.50},\ C_1,\ 4.0)$$

$$(A_{.50},\ C_1,\ C + E)$$

$$(A_{.50},\ C_3,\ 4.0)$$

$$(A_{.50},\ C_3,\ C + E).$$

Thus $(A_{.25},\ C_3,\ 4.0)$, for example, designates that projection which is based on an adjustment factor of .25 in determining the number of beneficiaries, coverage projection 3, an earning rate on fund assets of 4.0 per cent, and, like all other projections of this set, benefits per beneficiary derived as a projection of a trend and contributions per covered worker projected as a constant (i.e., the trend appeared to be horizontal).

The "Most Likely" Group

Discussion of the basic set of projections will focus on this group of eight of the total of eighty.[1] Their projected level of fund assets and their net change in holdings are shown in Table 26. The total

[1] As noted earlier, a tabular supplement containing all eighty tables as well as the ninety-six referred to in Chapter 6 is on file at the National Bureau of Economic Research.

TABLE 26

Fund Levels and Accumulations for the "Most Likely" Group of the Basic Set of Projections of Private Industrial Pension Plans, 1961-81

(billion dollars)

Year	$(A_{.25}, C_1, 4.0)$		$(A_{.25}, C_1, C+E)$		$(A_{.25}, C_3, 4.0)$		$(A_{.25}, C_3, C+E)$	
	Fund Level	Annual Fund Accumulation	Fund Level	Annual Fund Accumulation	Fund Level	Annual Fund Accumulation	Fund Level	Annual Fund Accumulation
1961[a]	55.3	5.3	55.3	5.3	55.3	5.3	55.3	5.3
1962	61.3	6.0	61.1	5.8	61.3	6.0	61.2	5.9
1963	67.5	6.2	67.1	6.0	67.7	6.4	67.4	6.2
1964	73.9	6.4	73.3	6.2	74.4	6.7	73.9	6.5
1965	80.5	6.6	79.6	6.3	81.4	7.0	80.8	6.9
1966	87.4	6.9	86.2	6.6	88.7	7.3	88.0	7.2
1967	94.4	7.0	93.0	6.8	96.3	7.6	95.5	7.5
1968	101.5	7.1	99.8	6.8	104.1	7.8	103.2	7.7
1969	108.8	7.3	106.7	6.9	112.0	7.9	111.1	7.9
1970	116.1	7.3	113.7	7.0	120.2	8.2	119.2	8.1
1971	123.6	7.5	120.8	7.1	128.5	8.3	127.5	8.3
1972	131.1	7.5	128.1	7.3	137.0	8.5	136.0	8.5
1973	138.7	7.6	135.4	7.3	145.5	8.5	144.5	8.5
1974	146.2	7.5	142.7	7.3	154.1	8.6	153.1	8.6
1975	153.8	7.6	150.1	7.4	162.6	8.5	161.7	8.6
1976	161.4	7.6	157.7	7.6	171.3	8.7	170.5	8.8
1977	169.2	7.8	165.5	7.8	179.9	8.6	179.2	8.7
1978	176.9	7.7	173.5	8.0	188.4	8.5	187.9	8.7
1979	184.5	7.6	181.7	8.2	196.8	8.4	196.7	8.8
1980	192.3	7.8	190.0	8.3	205.2	8.4	205.4	8.7
1981	200.0	7.7	198.7	8.7	213.6	8.4	214.2	8.8

Year	$(A_{.50}, C_1, 4.0)$ Fund Level	$(A_{.50}, C_1, 4.0)$ Annual Fund Accumulation	$(A_{.50}, C_1, C+E)$ Fund Level	$(A_{.50}, C_1, C+E)$ Annual Fund Accumulation	$(A_{.50}, C_3, 4.0)$ Fund Level	$(A_{.50}, C_3, 4.0)$ Annual Fund Accumulation	$(A_{.50}, C_3, C+E)$ Fund Level	$(A_{.50}, C_3, C+E)$ Annual Fund Accumulation
1961[a]	55.3	5.3	55.3	5.3	55.3	5.3	55.3	5.3
1962	61.3	6.0	61.1	5.8	61.3	6.0	61.2	5.9
1963	67.5	6.2	67.1	6.0	67.7	6.4	67.4	6.2
1964	73.9	6.4	73.2	6.1	74.3	6.6	73.9	6.5
1965	80.5	6.6	79.6	6.4	81.3	7.0	80.7	6.8
1966	87.3	6.8	86.1	6.5	88.5	7.2	87.8	7.1
1967	94.2	6.9	92.8	6.7	96.0	7.5	95.2	7.4
1968	101.2	7.0	99.5	6.7	103.6	7.6	102.7	7.5
1969	108.3	7.1	106.2	6.7	111.3	7.7	110.4	7.7
1970	115.4	7.1	113.0	6.8	119.1	7.8	118.2	7.8
1971	122.5	7.1	119.9	6.9	127.0	7.9	126.1	7.9
1972	129.7	7.2	126.8	6.9	134.9	7.9	134.1	8.0
1973	136.7	7.0	133.6	6.8	142.7	7.8	142.0	7.9
1974	143.6	6.9	140.4	6.8	150.4	7.7	149.9	7.9
1975	150.4	6.8	147.2	6.8	158.0	7.6	157.7	7.8
1976	157.2	6.8	154.0	6.8	165.5	7.5	165.5	7.8
1977	163.8	6.6	160.9	6.9	172.8	7.3	173.2	7.7
1978	170.1	6.3	167.8	6.9	179.8	7.0	180.7	7.5
1979	176.3	6.2	174.7	6.9	186.5	6.7	188.0	7.3
1980	182.1	5.8	181.6	6.9	192.9	6.4	195.2	7.2
1981	187.8	5.7	188.5	6.9	199.0	6.1	202.4	7.2

Source: NBER projections. Fund level is as of the end of the year.

[a]From Alfred M. Skolnik, "Growth of Employee-Benefit Plans, 1954-61," *Social Security Bulletin,* April 1963.

accumulation indicates how powerful a role pension funds will play among the holders of financial assets, while the annual net change in fund levels is a summary measure of the strength that pension funds as a group will bring to bear in the capital markets each year—i.e., in a not fully defined way and subject to numerous qualifications, it is a measure of the net new finance provided each year by pension fund earnings.[2]

Examination of the table demonstrates that the words "rapid growth" that have been used to characterize the recent past history (say, the last decade) of the private industrial pension plan structure will also be applicable to the twenty years that follow. Under every one of the group of eight projections, a great increase in reserves is projected. Table 27 shows that the group is bounded at its lower end by a projection that puts 1981's reserves at almost three and one-half times 1961's and at its upper limit by a projection of a 1981 level just under four times the holdings at the end of 1961.

It may thus be concluded that, by any of the "likely" projections in the basic set, the dimensions of private industrial pension plans by the end of 1981 will be formidable. Clearly, if at current levels of fiscal flows pension plans exert substantial influence on basic economic processes, as Murray and Cagan have shown with investment and saving, respectively, this can become even more important over time. It is worth repeating at this point that these eight projections cover a wide spectrum of assumptions; in other words, if they all lean in the same direction, it is a sign that the wind is blowing from that quarter.

Moreover, it is encouraging to note the very close correspondence within the "most likely" group between the projections that are based on a fund earnings rate of 4.0 per cent plus a trend value (in this case a constant) for C/W and those that are based on a trend value for contributions plus earnings taken as a combined total. As explained in Chapter 3, as good a case could be made for viewing

[2] The most serious qualification is the reminder that net new finance and new additional saving should not be considered as necessarily synonymous. For private industrial pension plans, however, there is good reason to believe that the two are running close together and will continue to do so in the future, but this is a complicated story. For its full development, see Phillip Cagan's study, *The Effect of Pension Plans on Aggregate Saving: Evidence from a Sample Survey*, New York, NBER, 1965.

TABLE 27

Range of Fund Levels and Accumulations for the "Most Likely" Group of the Basic Set of Projections of Private Industrial Pension Plans, 1961-81

(billion dollars)

Year	Fund Level			Annual Fund Accumulation		
	High	Low	Difference	High	Low	Difference
1961	55.3	55.3	0.0	5.3	5.3	0.0
1962	61.3	61.1	0.2	6.0	5.8	0.2
1963	67.7	67.1	0.6	6.4	6.0	0.4
1964	74.4	73.2	1.2	6.7	6.1	0.6
1965	81.4	79.6	1.8	7.0	6.3	0.7
1966	88.7	86.1	2.6	7.3	6.5	0.8
1967	96.3	92.8	3.5	7.6	6.7	0.9
1968	104.1	99.5	4.6	7.8	6.7	1.1
1969	112.0	106.2	5.8	7.9	6.7	1.2
1970	120.2	113.0	7.2	8.2	6.8	1.4
1971	128.5	119.9	8.6	8.3	6.9	1.4
1972	137.0	126.8	10.2	8.5	6.9	1.6
1973	145.5	133.6	11.9	8.5	6.8	1.7
1974	154.1	140.4	13.7	8.6	6.8	1.8
1975	162.6	147.2	15.4	8.6	6.8	1.8
1976	171.3	154.0	17.3	8.8	6.8	2.0
1977	179.9	160.9	19.0	8.7	6.6	2.1
1978	188.4	167.8	20.6	8.7	6.3	2.4
1979	196.8	174.7	22.1	8.8	6.2	2.6
1980	205.4	181.6	23.8	8.7	5.8	2.9
1981	214.2	187.8	26.4	8.8	5.7	3.1

Source: Table 26.

contributions as determined in part by earnings (or vice versa), i.e., for taking combined earnings plus contributions as the relevant variable to project, as for asserting that contributions and earnings each have a life of their own and should therefore be projected separately. Since these equally tenable points of view lead to quite different projection procedures, it is reassuring that they provide virtually identical projections of fund assets, as can be confirmed by comparing the pairs of projections in Table 26 that are alike in A_i and C_j but differ in having 4.0 or $C + E$ as the r_k assumption. Annual net accumulations, i.e., first differences in fund levels projected by the alternative r_k, are not so close, but can be taken as giving much the same kinds of indications about what the net asset acquisition proclivities of pension funds will be like.

Table 28 and Chart 4 indicate the bounds within which the growth suggested by the eight projections will take place. Over time the spread widens between the lower and upper bounds of the projections that seem "most likely" in the basic set. Thus, if our interest is in projecting as little as five years ahead, all of them are in close accord. The average projected value for 1966 is $87.5 billion and the spread between the highest and lowest is 3 per cent of this, some $2.6 billion. By the end of the period the spread between the highest and the lowest is ten times as large, $26.4 billion, which represents 13 per cent of the average value. Of course, there is greater uncertainty about net annual accumulations than fund levels in the future. Arithmetically this is the case simply because summing is a smoothing operation and differencing a "noisy" one. (Compare the two percentage columns of Table 28.) It should be borne in mind that these are projections of book values, not market values. Therefore, none of the projected growth over the next generation is due to inflation or unrealized capital gains on assets already in pension fund portfolios.

To point up the growth implication of the projections, we averaged the annual values of all eight and computed the rates of growth over specified periods (see Table 29). That these rates of growth decline over time is "comforting"; or rather, had this not occurred, the projections would indeed be "alarming." However, whatever additional insights this information provides are more directly and efficiently obtainable from an examination of the first differences of fund levels. This item, annual fund accumulation, is a measure of

TABLE 28

Average Annual Fund Levels and Fund Accumulations for the "Most Likely" Group of the Basic Set of Projections of Private Industrial Pension Plans, 1961-81

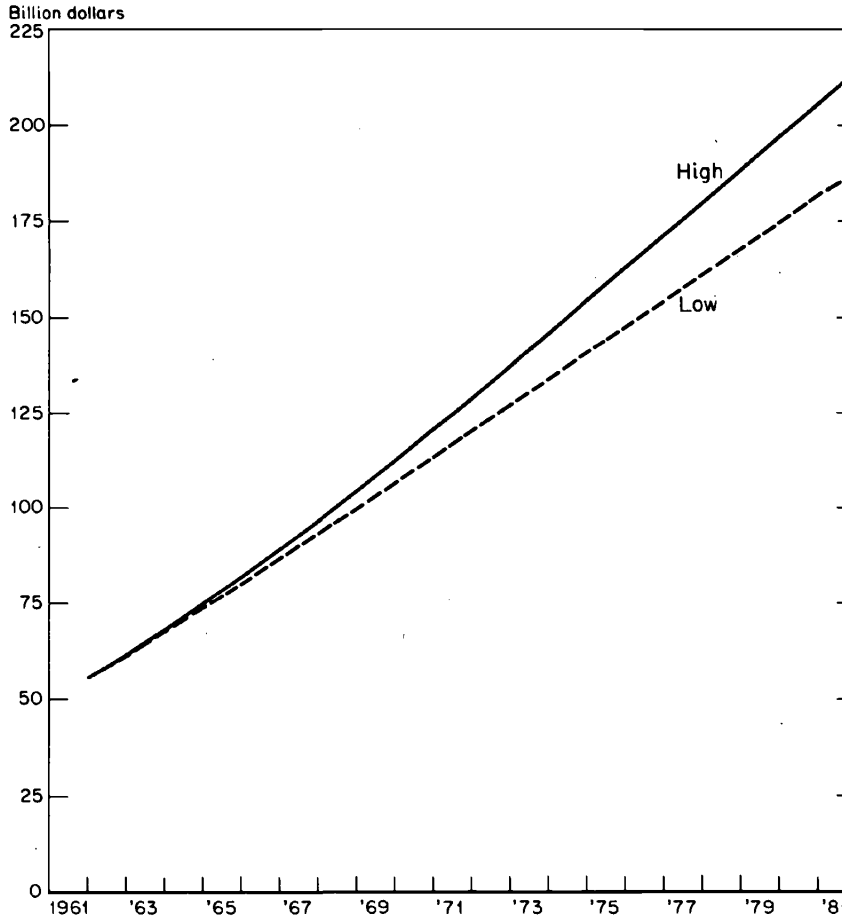
(billion dollars)

Year	Average Fund Level[a]	Difference Between Highest and Lowest Value as Per Cent of Average	Average Annual Fund Accumulation[a]	Difference Between Highest and Lowest Value as Per Cent of Average
1961	55.3	0.0	5.3	0.0
1962	61.2	0.3	5.9	3.4
1963	67.4	0.9	6.2	6.5
1964	73.9	1.6	6.4	9.4
1965	80.6	2.2	6.7	10.4
1966	87.5	3.0	7.0	11.4
1967	94.7	3.7	7.2	12.5
1968	102.0	4.5	7.3	15.1
1969	109.4	5.3	7.4	16.2
1970	116.9	6.2	7.5	18.7
1971	124.5	6.9	7.6	18.4
1972	132.2	7.7	7.7	20.8
1973	139.9	8.5	7.7	22.1
1974	147.6	9.3	7.7	23.4
1975	155.2	9.9	7.6	23.7
1976	162.9	10.6	7.7	26.0
1977	170.6	11.1	7.7	27.3
1978	178.1	11.6	7.6	31.6
1979	185.7	11.9	7.5	34.7
1980	193.1	12.3	7.4	39.2
1981	200.5	13.2	7.4	41.9

[a]These are simple averages of Table 26.

CHART 4

Range of Fund Levels for the "Most Likely" Group of the Basic Set of Projections of Private Industrial Pension Plans, 1961–81



Source: Table 27.

TABLE 29

Rates of Growth of Private Industrial Pension Fund Assets over Selected Periods, 1961-81

(per cent)

Period	Rate of Growth[a]
From 1961 to Specified Terminal Date	
1961-66	9.6
1961-71	8.5
1961-76	7.5
1961-81	6.7
Over Successive Five-Year Periods	
1961-66	9.6
1966-71	7.3
1971-76	5.5
1976-81	4.2

[a] Based on average of the eight projections in the "most likely" group, Table 28.

the role that pension plans will play in the capital market, the strength that they will bring to bear each year as net demanders of securities and other assets. Quite legitimately, therefore, we are not simply concerned with the projection of pension fund asset holdings at a number of benchmark dates. Of equal interest is the magnitude derivable from a time series of changes in holdings—each year's accumulations.

A rough sketch of the dynamics of net fund accumulations under a "typical" pension plan would look somewhat like this: In the early stages a rapid accumulation can be expected as contributions (both on the score of past and present service) attuned to the level of future benefits are made, while current benefit payments are low. As the fund accumulates, earnings would become a more important component of the set of fiscal flows, and with the passage of time benefits would start to catch up with contributions.

At some point the net difference between contributions and benefits

would turn negative; for a while fund earnings would take up the slack and pension fund assets would rise, but by smaller amounts. Finally, with a population whose age and sex contours were fixed (basically as many entering, i.e., newly covered, as leaving, i.e., retiring), whose salary scales were fixed, and under a plan whose benefit provisions were invariant, a point would be reached where benefits would balance contributions plus fund earnings; the plan would have matured. The fiscal counterpart of this condition is that the pension fund, while a large *holder* of assets, would on net balance not be an acquirer of assets. Its role in providing net new finance would be nil.[3]

Almost by definition, the plan of a growing firm is not likely ever to reach maturity. Nor is it likely that the aggregate of all pension plans would ever reach this stage. For one thing, our population can be expected to grow—hence more will enter plans than will leave them. For another, salaries (and planned benefits along with them) will continue to rise if for no other reason than an increase in productivity. Still a third reason lies in the strong possibility that benefit formulas will continue to be improved, and the contributions necessary to build up a fund for this contingency will be continually ahead of the benefits that will tend to draw the fund down at some later date. Thus, no matter how long the period of projection, a stage of zero growth in pension funds in the aggregate is, in all probability, a chimera. Reinforcing these conclusions for the aggregate of industrial pension funds is the fact that their structure in reality consists of a large number of plans introduced at different times and hence in different stages of this never-to-be-achieved approach to "maturity."

Do the data indicate that over the next twenty years industrial pension funds will reach the height of their power in the capital markets and then enter a stage of declining strength? The answer, based on the eight projections in the "most likely" group, is ambiguous, but on balance it would appear that a qualified "yes" is in order.

For three of the projections—($A_{.25}$, C_1, 4.0), ($A_{.25}$, C_3, $C + E$), and ($A_{.50}$, C_1, $C + E$)—the inference apparently is a constant first difference over the late 1970's and early 1980's. This could well presage a maximum at some later, not too distant date in the amount of assets

[3] Pension funds would still be important, however, for portfolio shifts could have important implications for the capital markets and those who seek finance therein.

accumulated each year. And indeed, this kind of behavior clearly characterizes four projections of the group of eight—($A_{.25}$, C_3, 4.0), with its maximum indicated in 1976; ($A_{.50}$, C_1, 4.0); ($A_{.50}$, C_3, 4.0); and ($A_{.50}$, C_3, $C + E$), all peaking around 1971 or 1972. Only ($A_{.25}$, C_1, $C + E$) shows no sign of reaching its maximum (see Table 26 for supporting data). There is thus a real likelihood that the peak in pension funds' annual demands on the capital markets will be reached sometime in the next twenty years.

This does not mean that the projections imply that within the next twenty years pension funds will cease accumulating assets; it simply means that sometime in the period covered by the projections, private industrial pension funds will start accumulating less each year. It is, of course, not known what the ultimate size of pension fund assets will be. However, the behavior of most of those projections show a very flat approach to the maximum and departure from it, and so it appears that pension funds will be accumulating at a healthy rate for a long time—well beyond the next twenty years.

Explorations in Depth

The main points of the basic set of projections have already been brought out through examination of the "most likely" group of projections in that set. In a sense, the "mean" of those projections has been discussed. And carrying out the analogy, this section will investigate that set's "variance." In other words, the alternative assumptions that went into generating the whole family of eighty projections will be analyzed to ascertain which of them importantly affect the results. Closely related is another interest: If some of the less likely alternatives really occurred, how different would the results be? One way of answering this question is to look at all eighty of the projections. But this is a completely unstructured excursion, the labor of which is not likely to be rewarded with a commensurate amount of insight.

A more purposeful and also efficient mode of proceeding would be to standardize for all but one of the determining assumptions and explore the ensuing pattern of variations that characterize the projections. Specifically, to see the effect of varying the adjustment factor, a particular C and a particular r could be chosen. Similarly, A and r

could be fixed and C varied to see how the projected values changed with C alone. And, of course, if a particular A and C were chosen, the variations dependent on r could be isolated.

It may be asked why P/B and C/W are not analyzed in the same way. They are, in a later chapter, where alternatives to the P/B and C/W of the basic set are explored. Here, however, a particular P/B and C/W for the basic set have already been chosen, so these two are fixed throughout the discussion.

In what follows, variations in the adjustment factor, the coverage assumption, and the earnings rate are examined in depth. In connection with these explorations we will, where it is felt necessary, elaborate somewhat more on methods than was done in Chapter 2. Thus in the discussion of the adjustment factor that follows, the method of projecting beneficiaries is reviewed briefly and the earlier description of the A factor is expanded. All this will necessarily run in the vein of the earlier discussion.

Adjustment Factor

Of the variables relevant to projections of the future magnitude of pension plan inflows, outflows, and asset levels, the one that can probably be estimated with least error is number of beneficiaries. This is because a major portion of beneficiaries, even over a period as long as the next twenty years, will come from currently employed and retired persons. Since the age distribution of covered and retired workers at the start of the projection period is "known," by application of mortality rates the group can be shifted into the retired ranks (or within the retired ranks) with the fair degree of certainty that comes from application of group experience to large numbers. Of course, the mortality rates here are projections of experience and thus are subject to some uncertainty; nonetheless they constitute stronger evidence than is available for estimating any of the other determinants of pension plan fiscal flows.

Assume a given retirement age of, say, 65. Beneficiaries at the end of year $t + n$ (1976 if t equals 1961 and n equals 15) are those covered in year t who are at least $65 - n$ (or 50 years old) at the end of year t and survive through year $t + n$, plus those of the beneficiaries as of the end of year t who survive to the end of $t + n$.

As mentioned above, this is an incomplete statement of the case, since over the course of the n years (a) some workers covered at the end of t will leave covered employment and go to a position which will not carry a pension right or will become unemployed, while (b) some other workers older than $65 - n$ but not covered at the end of t will be covered and eligible for benefits as pension plans are extended to them.[4] There is, of course, no reason to expect (a) and (b) to be precisely equal, although one could argue that both will involve small numbers, and, therefore, that for practical purposes matters can be left at a stand-off with no adjustment necessary.

In support of this contention one could claim that: (a) will be small because covered employees in this age category (over 45) are not likely to leave employment voluntarily, and a fraction of those who do will leave with a vested right; moreover, involuntary departures through firing, plant closing, or business failure are relatively rare; (b) will also be relatively small because it is not usual that persons over 45 are newly hired in covered employment. Indeed, the high cost of providing a pension for a new older worker is cited as a reason for the reluctance to hire people over 40. (Whether it is a valid reason is another question.) Moreover, if a worker over 45 is newly hired in covered employment, his pension is likely to be small, with the error or oversight in not including him likewise small. Finally, while pension plan coverage will grow over the next generation, it will probably be at a slower rate than over the past, and in any event only a relatively small fraction of those newly covered will be over 45.

However, in my judgment this does not add up to a convincing argument that (a) and (b) errors will be small or offset one another, primarily because in the context of the preceding argument under (b) notice should also be taken of employees 45 and over of firms that have just instituted coverage. In this case it is not at all rare for workers in this age group to come into the covered ranks and be eligible for benefits. Therefore, in my view, the (a) correction will, in all likelihood, not be as large as the (b) adjustment, for under any of the four coverage assumptions sizable increases in coverage are projected, and it is really not likely that some fraction of these

[4] The projections cover a twenty-year period, so obviously only persons 45 or older will be involved.

persons will fail to be in age groups 45 and over as of the end of year t. That is to say, if one projects (as in C_3, for example) a virtual doubling of the number of covered workers between 1961 and 1981, it would be strange indeed if the (b) numbers did not outweigh the (a) numbers. Therefore it was felt necessary on net balance to add to those who are in the ranks of potential beneficiaries because of the increase in coverage projected each year.

It was much easier to recognize the need for this kind of adjustment than to determine what its magnitude should be. The only clue is that the adjustment, considered to be a fraction of the newly covered each year in the age groups 45 and over as of the end of 1961, should lie between zero and one. It should not be zero, which would mean including none of the newly covered, for the reasons just developed, and it should not be one, which would mean including the newly covered proportionately on the basis of the 1961 distribution of covered employees, because that would fail, first, to allow for the fact that newly covered workers are likely to be, on average, lower in age than presently covered workers and, second, it would be overlooking the need for some correction of the (a) type noted above.

In considering the remaining possible (and more likely) fractions used for A_i—.25, .50, and .75—the higher the fraction, the lower the implicit adjustment for (a) or the closer the age distribution of the newly covered each year to the age distribution of the total stock of covered workers. An example of the numerical procedures follows.

As of the end of 1961 (or the start of 1962), covered male workers aged 45–49 came to an estimated 2,304,000 (Table 18). The mortality rate of 5.093 per thousand eliminated 11,700 of these workers during 1962. However, using C_1 in this particular example, an increase in total coverage over 1962 of 766,000 was projected; some 568,372 (i.e., 74.2 per cent) were assumed to be male. As of the end of 1961, males between the ages of 45 and 49 comprised 13.74 per cent of all covered male workers, or 78,090 of the newly covered employees. For reasons noted above, this was considered to be an overstatement and hence only a fraction of this amount was taken as the addition to this sex-age group. With $A_{.50}$, the fraction would be one-half and the addition 39,050. This constituted an offset to the 11,700 who left it because of mortality. In 1962, therefore, over the year there was a net addition

to the group of male covered workers aged 45 to 49 as of the end of 1961 of 27,350, which provided a figure of 2,331,300 (i.e., 2,304,000 + 27,350) for this group's population as of the end of 1962.[5]

Repeating the method for 1963, some 11,800 were eliminated by application of the appropriate mortality rate. The coverage of 2,331,300 in this group represented 13.45 per cent of total male coverage at the start of 1963 (17,340,000). Applying this percentage to the tentative increase in males in this age group (again 568,372) and then multiplying by .50 gives an increase of 38,000 and a population figure for the end of 1963 (start of 1964) of 2,357,700.

It is interesting to observe that the $A_{.50}$ adjustment actually involves more additions for the lowest male and female age group—45–49 as of the end of 1961—on the score of increased coverage than departures due to mortality, so that by the end of the period, when all survivors in this group have entered the ranks of beneficiaries, there are more people in it than at the start. For the other age groups the behavior is more parabolic over time; i.e., the number in the group goes up as new additions outweigh mortality up to some year and then the mortality drain becomes dominant and the number starts to fall.

Most of this report has concentrated on the findings based on $A_{.25}$ and $A_{.50}$, which appear to be the most realistic of the A_i values. There is some basis for both of these preferences. The preference for $A_{.50}$ goes beyond the simple conclusion that it is a good compromise value for a variable which can lie between zero and one, but it is conditional on the fact that C_3 is also preferred, a point developed above. If C_3 is accepted as most credible, the data of Table 30 favor $A_{.50}$. The "actual" number of beneficiaries of private industrial pension plans as of the end of 1962 was 2,090,000; [6] of all the projected values in the table, the $A_{.50}$ group comes closest to this figure.

A case, however, can also be made for a value close to A_0, say, $A_{.25}$. In an earlier stage of this study, beneficiaries were simply projected by successive annual application of mortality rates to the covered and annuitant population as of the end of 1961. In effect, an adjustment factor of zero was used. To determine how much faith might be placed

[5] The numbers used in this illustration have been rounded, which accounts for the slight arithmetic discrepancies here and in the next paragraph.

[6] *Social Security Bulletin,* April 1964, p. 16.

TABLE 30

Projected Number of Beneficiaries for All Adjustment Factors and Coverage Assumptions, End of 1962

(thousands)

Coverage Assumption	Adjustment Factor				
	A_0	$A_{.25}$	$A_{.50}$	$A_{.75}$	A_1
C_1	2,083	2,085	2,088	2,090	2,093
C_2	2,083	2,087	2,090	2,094	2,098
C_3	2,083	2,087	2,091	2,094	2,098
C_4	2,083	2,087	2,091	2,095	2,098

Source: Table 19.

in this method, it was used to "project" over a period for which the data were known—by age and sex, as of the end of 1950, to the end of 1960.[7]

The test projected 1,804,000 beneficiaries as of the end of 1960, while the actual number (an estimated figure, of course, but estimated with a greater degree of precision and a figure considered "correct") for that data was 1,780,000. The trial projection over a decade was only 24,000, or a mere 1.3 per cent off the mark. This augurs well for the "actuarial" method used in the projections but, more pointedly, it seems to argue particularly for A_0. But here one has to face up to the question of whether to base his judgment on the numbers, whatever they may be, or on his feelings about the process. The author has not relied on A_0 because, in his judgment, one cannot expect those leaving covered for noncovered employment to be as numerous as the newly covered age 45 and over.

Given that the case is not definitive for either $A_{.25}$ or $A_{.50}$, the importance of different A's must be assessed. Here and in the rest of

[7] This test was of necessity more crude than the rest of the projections, primarily because with the data for 1950 the pension population could not be broken down more finely than by ten-year age groups.

this section, the coverage assumption is fixed at C_3 and the effect of variations in the adjustment factor on beneficiaries, fund levels, and annual accumulations is explored. A summary for beneficiaries appears in Table 31. It may be concluded that the "correct" A factor to choose is not a matter of small consequence. It *does* make a difference which A_i is chosen, and the difference, as one would expect, becomes more pronounced with the passage of time. Thus by 1981, the range of the

TABLE 31

Projected Number of Beneficiaries for Coverage Assumption C_3 and Five Adjustment Factors, End of Year, 1961-81

(thousands)

Year	Adjustment Factor				
	A_0	$A_{.25}$	$A_{.50}$	$A_{.75}$	A_1
1961	1,900	1,900	1,900	1,900	1,900
1966	2,702	2,784	2,869	2,959	3,053
1971	3,864	4,187	4,541	4,929	5,353
1976	5,233	5,917	6,693	7,569	8,560
1981	6,614	7,731	9,032	10,543	12,298

Source: Table 19.

estimated number of beneficiaries (i.e., $A_1 - A_0$) is equal to 5.7 million, or over 60 per cent of the $A_{.50}$ figures.

As stated earlier, both A_0 and A_1 can be ruled out as highly unlikely and the best estimator is most probably somewhere between $A_{.25}$ and $A_{.75}$. Moreover, there are some grounds for holding that $A_{.75}$ is too high an adjustment factor. Average coverage under projection C_3 comes to 57 per cent of the estimated nonagricultural, nongovernmental employed labor force on July 1, 1970. On the other hand, the $A_{.75}C_3$ projection of beneficiaries as of July 1, 1980, has a male total that is equal to 67 per cent of the male population age 65 and over as of that date.[8] (See Tables 14, 16, 19, and 23.)

[8] This is on the basis of Actuarial Study No. 58's "low-cost" estimate or 61 per cent of the "high-cost" figure.

There is nothing incorrect or incongruous per se about a *male* beneficiary percentage higher than the over-all coverage percentages, since the male coverage percentage was undoubtedly well above the combined male-female coverage fraction. Nonetheless, 67 (or even 61 on a different base) seems an excessively high percentage in view of the fact that the male population 65 and over does include those who

TABLE 32

Projected Number of Male Beneficiaries, $A_{.25}C_3$ and $A_{.50}C_3$, End of Year, 1961-81

(thousands)

Year	$A_{.25}C_3$	$A_{.50}C_3$	Year	$A_{.25}C_3$	$A_{.50}C_3$
1961	1,410	1,410	1971	3,025	3,285
1962	1,551	1,554	1972	3,281	3,597
1963	1,690	1,701	1973	3,524	3,898
1964	1,825	1,850	1974	3,753	4,186
1965	1,953	1,997	1975	3,965	4,457
1966	2,074	2,141	1976	4,159	4,709
1967	2,284	2,381	1977	4,425	5,045
1968	2,485	2,619	1978	4,677	5,367
1969	2,677	2,851	1979	4,910	5,672
1970	2,858	3,073	1980	5,123	5,955
			1981	5,313	6,213

Source: Table 19.

were agricultural workers, government employees, the self-employed, and workers in other employments not covered by private industrial pensions. On this evidence, only $A_{.50}$ and $A_{.25}$ seem valid in developing the likely set.

The annual estimates of male beneficiaries for $A_{.25}C_3$ and $A_{.50}C_3$ appear in Table 32, which requires little in the way of comment except the obvious one that the $A_{.50}$ projections are necessarily higher, by an amount that grows with the passage of time, so that by the end of the period the two estimates differ by 0.9 million. More meaning, perhaps, can be extracted from these data if they are related to the population age 65 or over, as in Table 23. In that comparison

beneficiaries of industrial pensions are related, albeit loosely,[9] to the job the industrial pension structure has to do.

By either reckoning (i.e., either $A_{.25}$ or $A_{.50}$) the industrial pension structure will become a much more powerful force than it presently is in the income support of the aged. Between a quarter and a third of persons 65 or over will be receiving private industrial pension benefits by 1980. But there will be a sharp disparity in payments between men and women, as is to be expected from an arrangement tied up with previous employment, since men characteristically have such a status to a greater degree than women. About 50 per cent of the males 65 and over will receive private industrial pension payments by 1980, and the likely figure for women is on the order of 16 per cent. Much the same conclusion follows from either $A_{.25}$ or $A_{.50}$: a great growth in the number and importance of private industrial pension beneficiaries in absolute number and relative to OASDI; but the latter will of course have a much larger number of beneficiaries, with the difference more pronounced in the case of women than of men.[10]

Let us turn now to the projections of the reserves held by pension funds. To focus on variations in the A factors, the coverage assumption is once again fixed at C_3 and the earnings rate at 4 per cent (Table 33).

The differences are systematic with the A factor and their importance is a function of time. Thus, if one is concerned with the likely course of pension fund asset holdings over the *next decade*, the A factor would appear to be of little concern, the maximal difference in reserves being on the order of $6.5 billion as of the end of 1971, or about 5 per cent of the level projected on the basis of $A_{.50}$. However, the difference becomes more pronounced as the time purview of the projections is extended. By the end of 1981, if the possibility of a full range of A factors from zero to one is considered, there is a $62 billion difference, more than 30 per cent of the projected value under $A_{.50}$.

If examination is limited to those factors established as most reason-

[9] Because persons are included in the 65 and over group who worked in agriculture or for government, or who were self-employed, and could therefore not have built up any industrial pension expectancy.

[10] This and indeed any male-female comparison for industrial plans is less reliable than the total beneficiary figures because the basis of the male-female breakdown is quite insecure.

TABLE 33

Projected Levels of Private Industrial Pension Funds for Five Adjustment Factors, Coverage Assumption C_3, and 4 Per Cent Earnings Rate, End of Year, 1961-81

(billion dollars)

Year	Adjustment Factor				
	A_0	$A_{.25}$	$A_{.50}$	$A_{.75}$	A_1
1961	55.3	55.3	55.3	55.3	55.3
1966	88.9	88.7	88.5	88.3	88.2
1971	130.0	128.5	127.0	125.3	123.5
1976	176.5	171.3	165.5	159.2	152.2
1981	226.6	213.6	199.0	182.6	164.1

able—$A_{.25}$ and $A_{.50}$—the findings on level of reserves are not too divergent even by the end of 1981 (see Table 34). The $A_{.50}$ projected value is 93 per cent of the $A_{.25}$ projection for 1981. This suggests that the choice between the A factors within the likely group of the basic set of projections is not crucial. But what about the net annual change in fund levels, i.e., the annual accumulations of pension funds; is the A assumption critical for the findings here?

There is, of course, arithmetic warrant for presuming that variations in assumption affect the values of first differences relatively more strongly than the estimates of levels. That this presumption is valid for annual net changes in industrial pension funds is clearly borne out by the data of Table 35, especially those covering the second decade of the period of projection. Through 1971, no matter which of the A factors is used, pension funds will be heavy accumulators and likely to acquire more assets each year than in the year before. And if only the two most likely A factors are used, there will be quite a narrow range of expectations for the net annual purchases of pension funds through 1971. In any event, it can be said with reasonable confidence (if it is only the A factors that are free to vary) that private industrial pension funds will be making net annual purchases of about $8 billion in 1971.

TABLE 34

Projected Levels of Private Industrial Pension Funds, $A_{.25}$ and $A_{.50}$, with C_3 and 4 Per Cent Earnings Rate, End of Year, 1962-81

(billion dollars)

Year	Adjustment Factor	
	$A_{.25}$	$A_{.50}$
1962	61.3	61.3
1963	67.7	67.7
1964	74.4	74.3
1965	81.4	81.3
1966	88.7	88.5
1967	96.3	96.0
1968	104.1	103.6
1969	112.0	111.3
1970	120.2	119.1
1971	128.5	127.0
1972	137.0	134.9
1973	145.5	142.7
1974	154.1	150.4
1975	162.6	158.0
1976	171.3	165.5
1977	179.9	172.8
1978	188.4	179.8
1979	196.8	186.5
1980	205.2	192.9
1981	213.6	199.0

Source: Table 26.

This consensus disappears over the later ten years. By 1981 one extreme A factor, A_0, shows pension funds accumulating at over $10 billion per year; choice of the other polar A factor, A_1, leads one to believe that pension funds will have virtually ceased accumulating by that date, the change in holdings over 1981 being only $600 million.

If only $A_{.25}$ and $A_{.50}$ are used, even by 1981 the result is substan-

TABLE 35

Estimated Net Additions to Private Industrial Pension Funds for Five Adjustment Factors, C_3, and 4 Per Cent Earnings Rate, 1961-81

(billion dollars)

Year	Adjustment Factor				
	A_0	$A_{.25}$	$A_{.50}$	$A_{.75}$	A_1
1961	5.3	5.3	5.3	5.3	5.3
1966	7.4	7.3	7.3	7.2	7.1
1971	8.8	8.4	7.9	7.4	6.9
1976	9.6	8.6	7.5	6.2	4.8
1981	10.3	8.4	6.1	3.6	0.6

tially the same—pension funds will still be powerful accumulators, adding to their holdings at between $6.1 billion and $8.4 billion per year. Moreover, both of the preferred A factors suggest also that private industrial pension funds' maximum strength as annual accumulators will have been reached somewhat earlier in the period. With $A_{.50}$ the date seems to be around 1971 (1972 as determined from the annual data in the supplement), and with $A_{.25}$ the maximum would be reached in 1976. The annual net accumulation series is flat-topped in the region of the maximum, so the fact that peak years are different is not a stark disparity between the two sets of estimates.

In summary, conceptually the A factor is free to vary between zero and one. If these two polar possibilities, as well as some representative A's in between, are incorporated in the estimates of beneficiaries and consequently of pension fund levels and annual amounts of accumulation, wide ranges of difference show up in the projections, particularly in the later years of the period. Also, the ranges appear to be so broad as to seriously limit the usefulness of the projections. However, since some A factors seem highly unlikely, attention is concentrated on the more likely A's, which have been determined to be $A_{.25}$ and $A_{.50}$. Examination of the projections based on these assumptions indicates relatively small differences in projected mag-

nitudes. If other variables (i.e., assumptions) are held constant, whether $A_{.25}$ or $A_{.50}$ (or any A in between) is used turns out to be of small consequence. The projected number of beneficiaries, the level of fund assets, and the net annual change therein (both as to amount and pattern of behavior) would cluster closely enough to make the projections useful.

Coverage Assumptions

Some discussion of the coverage assumption appeared in the examination of the adjustment factor. This and the discussion of the C_j in Chapter 2 cover much of what there is to say, and it remains only to point up more particularly the magnitudes involved.

Table 36 uses $A_{.50}$, since some A_i had to be specified, and r equal to 4.0 per cent, and shows the variations in projected magnitudes associated with the C_j. One would not quite say that the four C assumptions result in projections so close to one another in magnitude that the choice among them is inconsequential, but the differences do not signify much. Whichever C_j is examined, given A and r, substantially the same indication as to the holdings of pension funds and their role in the capital market will result.

TABLE 36

Projected Private Industrial Pension Fund Levels and Net Annual Fund Accumulations for $A_{.50}$, 4 Per Cent Earnings Rate, and Four Coverage Assumptions, End of Year, 1961-81

(billion dollars)

	C_1		C_2		C_3		C_4	
Year	Fund Level	Annual Accumulation	Fund Level	Annual Accumulation	Fund Level	Annual Accumulation	Fund Level	Annual Accumulation
1961	55.3	5.3	55.3	5.3	55.3	5.3	55.3	5.3
1966	87.3	6.8	88.3	7.2	88.5	7.3	88.6	7.3
1971	122.5	7.2	125.6	7.6	127.0	7.9	127.8	8.1
1976	157.2	6.7	161.9	7.0	165.5	7.5	167.9	7.9
1981	187.8	5.6	192.9	5.6	199.0	6.1	203.8	6.6

Earning Rate Assumptions

This section examines the numerical implications of variations in r_k. Table 37 projects fund earnings via alternative interest rate assumptions of 3.5, 4.0, or 4.5 per cent and also projects contributions plus earnings as one total. A and C have been fixed, using $A_{.50}C_3$, and r

TABLE 37

Projected Private Industrial Pension Fund Levels and Net Annual Fund Accumulations for $A_{.50}$, C_3, and Four Earnings Rate Assumptions, 1961-81

(billion dollars)

	3.5 Per Cent		4.0 Per Cent		4.5 Per Cent		$C + E$	
Year	Fund Level	Annual Accumulation	Fund Level	Annual Accumulation	Fund Level	Annual Accumulation	Fund Level	Annual Accumulation
1961	55.3	5.3	55.3	5.3	55.3	5.3	55.3	5.3
1966	86.7	6.8	88.5	7.2	90.4	7.7	87.8	7.1
1971	122.0	7.2	127.0	7.9	132.2	8.7	126.1	7.9
1976	155.7	6.4	165.5	7.5	176.0	8.7	165.5	7.8
1981	182.6	4.6	199.0	6.1	216.9	7.8	202.4	7.1

varies among the possible rates it can assume. It would seem that sizable differences in fund levels and accumulations as of any given date are associated with the different rates that r_k could take on. This is particularly so for the latter part of the period of projection, as the influence of compounding different rates of growth becomes more pronounced.

However, this conclusion and the data of Table 37 should be viewed with caution. There are real grounds for believing that differential fund accumulations of the kind suggested by the table would not really eventuate in the face of different earnings rates, since the strong likelihood is that over the long pull contributions would be adjusted in the light of the earnings experience. This is not to deny that if a

sharp change in earnings occurred, it would take some time for the compensating variations in contributions to be implemented; thus, over the transitional period, differences in earnings rates would be significant. But this is not what variations in the r_k attempt to show, nor is it incorporated in the magnitudes of the table. Another reason to believe that contributions would be adjusted to compensate for changes in earnings is found in the process of determining whether plans are adequately funded. That is to say, if returns have been low, the assumed level of future earnings will logically be lower; the lower the assumed rate, the larger the fund required to assure the provision of a future stream of benefits. Indeed, a larger accumulation should be anticipated if the earnings rate is 3.5 per cent than if it proves to be 4 per cent or more.

One less equivocal point that does stand out from this comparison among the r_k is the closeness of the $(A_{.50}, C_3, 4.0)$ and $(A_{.50}, C_3, C + E)$ values, from which it may be inferred that 4.0 per cent and $C + E$ projected on the basis of trend are virtually equivalent in their effect. This equivalence between two essentially different bases of projection is assuring.

Comparison of Actual Fund Levels and Projected Values, 1962–65

The lapse of time between the development of our projections and their final readying for publication permits a comparison between the "actual" [11] magnitudes and this study's estimates of private industrial pension funds over a run of several years (see Table 38).

Apparently the projected fund values are close to actuality for the period 1962–65, and they would have been closer if the revised SEC figures had been available at the time the projections were made. The revision raised the 1961 fund level by $2.5 billion, and the differences between the actual and average projected values are $2.3 billion, $2.5 billion, $3.3 billion, and $4.7 billion in 1962, 1963, 1964, and 1965, respectively. A more severe test is to inquire into the degree of correspondence of the projected and actual annual accumulations. Here the projections seem to be about as "on the nose" as could be expected in 1962 and 1963, but considerably off the mark in 1964 and

[11] In fact these are estimates too, but they are subject to a lower degree of error than the projections of this study and have been assumed to be "true" values.

TABLE 38

Comparison of Actual and Projected Private Industrial Fund Levels and Annual Accumulations, 1962-65

(billion dollars)

	Fund Level				Annual Accumulation			
		Projected				Projected		
Year	Actual	High	Low	Average	Actual	High	Low	Average
1962	63.5	61.3	61.1	61.2	5.7	6.0	5.8	5.9
1963	69.9	67.7	67.1	67.4	6.4	6.4	6.0	6.2
1964	77.2	74.4	73.2	73.9	7.3	6.7	6.1	6.4
1965	85.0[a]	81.4	79.6	80.6	7.8	7.0	6.3	6.7

Source: Actual fund levels are from "Private Noninsured Pension Funds, 1964," SEC *Statistical Bulletin*, June 1965, Table 2, p. 33; projections are from Tables 27 and 28 of this study.

[a] Preliminary.

1965. The actual values in the latter two years are much larger than the projected high values. Unfortunately the four years of this comparison make up too short a period for generalizing with real certainty. The results do incline us more favorably toward the high end of the projected values ($A_{.25}$, C_3, 4.0) as against the averages of Table 28 and suggest that by the end of 1981 accumulated funds of private industrial pension plans might be closer to $235 billion than the $201 billion average projected value of Table 28. Thus, the level of fund accumulation might very well be above the projections; there is, however, no reason to conclude that the time pattern of annual accumulations and fund holding will be different than projected.[12]

As a qualification of this discussion of the discrepancy between our projections and actual results and what they portend, it should be

[12] A closer comparison of the SEC data with the estimates for insured and noninsured funds in Chapter 5 indicates that annual reserve accumulations of plans funded with insurance companies have been projected as slightly too high for 1962–65, but that the major shortfall has occurred in the projection of noninsured funds, the category in which the SEC upward revision was made. If the two trends continue through 1981, it would appear that total funds in the latter year might be considerably more than $214 billion.

remembered that our projections are, perforce, smooth, while the true path of accumulation is ragged and uneven. In particular, the record of the past shows a tendency toward constancy or even a slight decline in the annual amount of private industrial pension fund accumulations in business contractions and sharp spurts in expansions. The period 1962–65 has been one of continuous expansion; hence the gap between our projections and the actual results could well be higher for this stretch of years than what it would average out to over a period that included contraction years as well. Nonetheless the gap between what we said would happen and what did happen in the way of annual fund accumulations is large enough to suggest that more credence be given to the high portion of our range of projected values.

Summary

Even with the restriction of only one projection of benefit payments per beneficiary and similarly of contributions per covered worker, some eighty projections are generated by the various values that the A_i, C_j, and r_k might take on. However, it is possible on reasonable bases to pick out a preferred group of projections from this set. While each one of this preferred group (eight in all) is different in terms of specific magnitudes, all have pointed in the same direction:

1. Private industrial pension funds will continue to grow over the next twenty years and, for the most part, by annual amounts considerably greater than their current rate of fund accumulation.

2. Therefore the funds will be much more substantial holders of assets than they are at present, and will play a more powerful role in the capital markets as net new purchasers of financial assets.

3. In this latter connection, the projections point to a maximum in the annual amount of fund accumulations that will be reached sometime in the middle 1970's. Since the time series of annual fund accumulations is flat over most of its range, by the end of the period of projection (the early 1980's), private industrial pension plans will still be heavy net purchasers of stocks and bonds.

4. All the projections in the basic set incorporate the assumption of an invariant level of contributions per covered worker, and in all of them benefits per beneficiary are projected to grow at a slow rate—about $17 per year. Thus both contributions per covered worker and

benefits per annuitant will fall in relation to average earnings, which, if the history of the past is any guide, will certainly increase.

This is possible, and a decline both in P/B and C/W as a ratio of average gross earnings did occur over the last decade. But implicit in the basic projection set is a much sharper decline in these two ratios than did happen in the last ten years, and therefore the possibility that contributions per covered worker may grow over time should not be overlooked. To the extent that everything else that has been assumed does hold but C/W grows over time, the projected fund levels and net annual accumulations will fall short of actuality. Pension funds will hold more assets and will add more to them each year than the projections suggest. If benefits per beneficiary rise more sharply than the projections assume, this difference between the projected and actual values in the face of growing contributions per covered worker will be moderated or even inverted, depending on the relative rates of increase in P/B and C/W.

When trends are extended into the future, the implicit assumption must be some continuity in the underlying structure. Does the recent (September 1964) increase in pensions obtained by the United Automobile Workers—an increase of $1.45 per month (from $2.80 to $4.25) for each year of service and payable at age 62 without reduction, early retirement incorporating this basic benefit and an incentive retirement bonus, widows' pensions, and, finally, passing on of the $1.45 per month per year of credited service increase in benefits to those already retired—constitute a real change in structure and, hence, invalidate these projections? The answer, though difficult to prove, is probably no, since the decade of the 1950's probably witnessed increases equally pronounced. Moreover, it is not known at what speed these benefits will spread to other industries. Issues such as this are debatable enough to warrant the examination of alternatives (see Chapter 6).

5. A comparison of actual and projected values of the fund levels in 1962–65 suggests that the high values in the likely group, say, those obtained under projections ($A_{.25}C_3$, 4.0), may be the best. The period 1962–65 is too short to be a sure test; also these were years of expansion, and a test in a recession period might give different results.