REVIEW OF PERS ACTUARIAL ASSUMPTIONS AND METHODS

Actuarial valuation reports were collected from 78 PERS, covering 183 plans (or separately valued employee groups). What follows is an attempt to summarize assumptions and methods used, giving a general understanding for the continuum of actuarial bases. For many reasons, no attempt is made to draw any strong statistical conclusions. Foremost among the reasons are the following:

- Clearly, each PERS covers a unique employee group with its own demographic characteristics, operating in its own economic, political, and regulatory environment. This fact naturally hampers comparisons.
- There are subtleties to the structure and application of assumptions and methods, some of which cannot be captured in a two-dimensional tabular compilation. One good example is select and ultimate assumptions often used in withdrawal tables, disabled mortality, and salary scales. Another subtlety is the existence of "duty" and "nonduty" death and disability rates—we include only nonoccupational rates. To gloss over these important variations in drawing conclusions would be dangerous.

As in Section I, plans/employee groups have been placed into one of three categories: general employees, police and fire, and teachers. The same "other" plan types have been recategorized as in Section I.

The tables presented in this section organize available tabulated data into ranges. The ranges have been determined individually for each assumption. In reviewing the tables presented, it is important to remember that:

- Plan/groups whose valuations incorporated the applicable assumption but whose reports did not give adequate data for compilation have been excluded from the table presented. This exclusion clearly distorts the distributions shown.
- The ranges have been determined subjectively, based on the actual dispersion of data for each assumption. Other ranges that might cast the data in a somewhat different light could have been presented.
- In calculating "average" assumption rates for tabulating, distinctly nonactuarial methods have been employed. Assumptions for ages deemed to be central to the event type in question have been arithmetically averaged. For instance, in determining the average turnover assumption for a PERS, quinquennial rates (ignoring select rates for the first five years) from ages 25 to 45 were added and divided by five. PERS valuation reports not disclosing all five rates were excluded to avoid distortions.

Note that retirement rates have not been summarized. Plan provisions have too great an effect on these assumptions, rendering any compilation of them misleading.

As with the experience study summaries, our recommendation in reviewing the material provided is that anyone interested in drawing strong conclusions concerning PERS actuarial assumptions and methods should consult the reports directly for further study.

A. Actuarial Cost Methods

Table 12 indicates that the most popular funding method among PERS is the entry age method. This method determines accrued liability and annual cost by spreading costs over an individual's career as a level percentage of pay. It is generally the most conservative.

TABLE 12
ACTUARIAL COST METHODS

Method	No. of PERS by Type			
	General Employees	Police/Fire	Teachers/School	Total
Entry Age	59	44	28	131
Aggregate	3	4	2	9
Frozen Initial Liability	7	4	6	17
Projected Unit Credit	9	3	6	18
Pay-as-You-Go	2	1	1	4
Other	3	0	0	3

Except for "pay-as-you-go," projected unit credit is considered to be the least conservative among the methods. A common version of this method attributes the projected benefit to each year of service in proportion to the service credit accrued in each year, with the present value of that piece of benefit being the cost for that particular year. The other methods are generally considered to be somewhere in between.

The continuum can actually be reversed if the bulk of the plan benefit accrues over a relatively short period, and participants are expected to continue working past this stage with some regularity. Police and fire plans are often in this situation. In that case, the version of projected unit credit discussed previously is probably the most conservative. It attributes the benefit to the period when credited service is accruing, regardless of assumed retirement age.

B. Actuarial Asset Valuation Methods: Equities

PERS, like private employers, have significant portions of their assets invested in equities. These investments generally offer superior returns in exchange for added risk, in part because of volatility of market prices. And PERS, to an even greater extent than private employers, need to use whatever tools are at their disposal to mute any oscillations in annual contribution requirements. Large increases in required inflow may be hard to sell to the current legislature or to the electorate, and large decreases might incite cries for higher benefits for public employees. Stability in cost is crucial.

Asset-smoothing techniques are therefore very popular in PERS valuations, especially for equity investments. As shown in Table 13, about two-thirds of the PERS plan/groups use a genuine market-smoothing method. Use of cost as a valuation basis for equities tends to have a modest smoothing effect on asset values but is really more a mechanism for conservatism than an asset-averaging technique.

C. Actuarial Asset Valuation Methods: Fixed-Income Investments

PERS have traditionally held a larger percentage of their assets in fixed-income investments than private employers, although the current trend is toward more

TABLE 13
ACTUARIAL ASSET VALUATION METHODS FOR EQUITIES

Methods	No. of PERS by Type			
	General Employees	Police/Fire	Teachers/School	Total
Market Value	10	9	5	24
Smooth ≤3 years	16	8	6	30
Smooth >3 years	38	30	21	89
Book/Cost Basis	16	6	10	32
Other	1	1	0	2

equities (Table 14). Some jurisdictions still place severe or complete restrictions on a PERS's ability to hold equities. In addition, PERS tend to be mature plans with large retiree populations, requiring greater cash flow and therefore investments with higher current yields. It is therefore unlikely that PERS's allocations to fixed-income vehicles will decline much further in the future.

PERS use smoothing techniques to mute bond price fluctuations, particularly via two mechanisms:

- Smoothing their market values along with equities (usually over three to five years) or
- Amortizing the discount or premium in the original bond price, ensuring a smooth progression of values over the life of the bond.

D. Economic Assumptions: Interest Rates

The most visible and the most controversial of assumptions in a PERS valuation is the interest rate. "Raids" on public pension funds via more aggressive assumptions have been the topic of several articles in papers and major publications. Interest rate hikes have been the most scrutinized change.

Appearance and reality may be at odds, however. Table 15 shows more than half of the PERS have an interest assumption of either 7.75% or 8%, and the overwhelming majority are inside the 7–8.5% corridor. The more important question is: How does the interest rate compare with the other economic assumptions, namely, salary scale and inflation? The spreads between these assumptions are the real indicators of the aggressiveness of assumptions.

Nevertheless, Table 15 indicates that PERS interest assumptions fall in a range similar to that used by private employers.

E. Economic Assumptions: Salary Increases (Average of Rates at Ages 30, 40, 50, and 60)

Salary scales can be a single rate of increase assumed over an employee's career, rates that vary by age or service, or rates that vary by both age and service. It is also common to separate the rates of salary increase into the underlying rate of salary inflation and

TABLE 14
ACTUARIAL ASSET VALUATION METHODS FOR FIXED INCOME

Method	No. of PERS by Type			
	General Employees	Police/Fire	Teachers/School	Total
Market Value	6	6	2	14
Smooth ≤3 years	13	6	5	24
Smooth >3 years	35	29	14	78
Book/Cost Basis	28	14	22	64
Other	1	1	0	2

TABLE 15
INTEREST RATES

Interest Rate	No. of PERS by Type			
	General Employees	Police/Fire	Teachers/School	Total
6% or 6.5%	5	1	0	6
7% or 7.5%	16	10	9	35
7.75% or 8%	43	35	24	102
8.25% or 8.5%	15	5	7	27
8.75% or 9%	5	5	3	13

an additional component attributable to promotions/merit and increases in productivity.

Most of the PERS in Table 16 have average rates (from age 30 to 60) of between 5.5% and 7.5% per year, assuming the averaging method is a fair proxy for the real overall rate. If so, expected increases are slightly in excess of those generally assumed in private employer valuations. Anticipated rates in that sector are generally between 5% and 6% currently. Either conservatism is in evidence or there is a differential in salary increases between the public and private sectors.

F. Economic Assumptions: Inflation

The inflation assumption is used to determine the cost of postretirement benefit increases due to increases in the cost of living. Such increases, which have become less common in the private sector, are still the norm in PERS.

The consensus on long-term inflation among economists recently has been an expectation of 4% or less. What Table 17 indicates is that PERS valuations are reflecting a higher expectation of future cost-of-living increases, with almost three-fourths of PERS using a rate of at least 5%. This is another indication of actuarial conservatism.

G. Economic Assumptions: The Real Rate of Return (Difference between Interest and Inflation)

More important than the economic assumptions themselves are the relationships among the interest rate, inflation, and salary scale. The difference between interest and inflation is referred to as the real rate of return (Table 18). It is a function of the allocation of investments among different sectors of the capital market, but it can also be seen as the excess return available to the fund on the portion of assets covering retired liabilities (after paying inflationary increases).

TABLE 16
SALARY SCALES

	No. of PERS by Type			
Salary Scale Increase	General Employees	Police/Fire	Teachers/School	Total
Less than 5%	4	1	0	5
5% to 5.5%	4	1	1	6
5.5% to 6%	11	7	2	20
6% to 6.5%	14	8	7	29
6.5% to 7%	20	21	4	45
7% to 7.5%	12	3	10	25
More than 7.5%	5	2	5	12

TABLE 17
INFLATION RATES

	No. of PERS by Type			
Inflation Rate	General Employees	Police/Fire	Teachers/School	Total
3.5%	1	0	0	1
4% or 4.25%	4	4	5	13
4.5% through 4.75%	12	6	4	22
5% through 5.25%	28	13	9	50
5.5% through 5.75%	12	11	8	31
6% or 6.5%	6	11	4	21

TABLE 18
REAL RATES OF RETURN

Rate of Return	No. of PERS by Type			
	General Employees	Police/Fire	Teachers/School	Total
Less than 2%	5	6	1	12
2% to 2.5%	11	13	8	32
2.5% to 3%	7	6	5	18
3% to 3.5%	21	9	9	39
3.5% to 4%	17	10	5	32
More than 4%	2	2	2	6

The proper real rate of return assumption for a fund is a difficult item to assess, since it depends on current opinions of capital markets, which are diverse. We explore this topic a bit further in Section III.

For now, it appears that PERS are effectively using, in general, a modest real rate of return assumption, with less than 30% of the plans shown using a rate of 3.5% or higher.

H. Economic Assumptions: The Spread between Interest and Salary Increases (Average of Rates at Ages 30, 40, 50, and 60)

The difference between interest and salary scale, often referred to as "the spread," measures the real discounting of liabilities during an employee's working career.

Spreads in current valuations for private employers generally range from 2% to 3%. Lower spreads were prevalent in valuations ten to 20 years ago—such an increase is probably in line with the stagnation in real wage growth seen during the 1980s and early 1990s.

PERS appear to be more conservative in this regard, with about two-thirds of the group using a spread less than 2% (Table 19).

TABLE 19
SPREADS

Spread	No. of PERS by Type			
	General Employees	Police/Fire	Teachers/School	Total
Less than 0%	5	0	3	8
0% to 0.5%	0	1	2	3
0.5% to 1%	9	8	9	26
1% to 1.5%	12	8	5	25
1.5% to 2%	14	14	5	33
2% through 2.5%	24	11	3	38
More than 2.5%	5	3	2	10

I. Demographic Assumptions: Active Mortality (Average of Rates at Ages 40, 50, and 60)

Table 20 displays data concerning active mortality.

J. Demographic Assumptions: Disablement (Average of Rates at Ages 40, 45, 50, and 55)

Table 21 displays data on disablement rates.

TABLE 20
ACTIVE MORTALITY

Mortality Rate	No. of PERS by Type			
	General Employees	Police/Fire	Teachers/School	Total
Women				
Less than 0.2%	10	5	22	37
0.2% to 0.4%	43	37	13	93
0.4% to 0.6%	6	4	1	11
0.6% to 0.8%	2	2	0	4
More than 0.8%	1	0	0	1
Men				
Less than 0.2%	0	2	1	3
0.2% to 0.4%	10	5	16	31
0.4% to 0.6%	40	34	18	92
0.6% to 0.8%	9	6	1	16
More than 0.8%	4	1	0	5

TABLE 21
DISABLEMENT RATES

Disablement Rate	No. of PERS by Type			
	General Employees	Police/Fire	Teachers/School	Total
Women				
Less than 0.2%	8	3	11	22
0.2% to 0.4%	28	2	14	44
0.4% to 0.6%	14	9	5	28
0.6% to 0.8%	6	2	2	10
0.8% through 1.0%	3	3	0	6
More than 1.0%	0	6	1	7
Men				
Less than 0.2%	4	3	10	17
0.2% to 0.4%	30	2	13	45
0.4% to 0.6%	14	9	5	28
0.6% to 0.8%	8	2	4	14
0.8% through 1.0%	3	3	0	6
More than 1.0%	0	6	1	7

K. Valuation Assumptions: Withdrawal (Average of Rates at Ages 25, 30, 35, 40, and 45)

Table 22 displays data on withdrawal rates.

L. Valuation Assumptions: Retired Mortality (Average of Rates at Ages 60, 70, and 80)

Table 23 displays data on retired mortality rates.

TABLE 22
WITHDRAWAL RATES

	No. of PERS by Type			
Withdrawal Rate	General Employees	Police/Fire	Teachers/School	Total
Women				
Less than 2%	2	12	0	14
2% to 4%	5	18	4	27
4% to 6%	8	6	15	29
6% to 8%	20	1	11	32
8% through 10%	11	0	2	13
More than 10%	8	2	1	11
Men				
Less than 2%	2	12	0	14
2% to 4%	6	18	12	36
4% to 6%	19	6	8	33
6% to 8%	13	1	11	25
8% through 10%	8	1	1	10
More than 10%	6	1	1	8

TABLE 23
RETIRED MORTALITY RATES

	No. of PERS by Type			
Mortality Rate	General Employees	Police/Fire	Teachers/School	Total
Women				
Less than 2%	29	25	16	70
2% to 3%	30	11	10	51
3% to 4%	2	4	1	7
4% to 5%	0	2	0	2
More than 5%	1	2	0	3
Men				
Less than 2%	0	0	0	0
2% to 3%	1	2	4	7
3% to 4%	26	20	19	65
4% to 5%	34	19	4	57
More than 5%	1	3	0	4

M. Valuation Assumptions: Disabled Mortality (Average of Rates at Ages 60, 70, and 80)

Table 24 displays data on disabled mortality rates.

TABLE 24
DISABLED MORTALITY RATES

Mortality Rate	No. of PERS by Type			
	General Employees	Police/Fire	Teachers/School	Total
Women				
Less than 3%	2	3	2	7
3% to 5%	15	12	10	37
5% to 7%	8	6	6	20
7% to 9%	9	5	3	17
More than 9%	0	0	1	1
Men				
Less than 3%	0	0	0	0
3% to 5%	1	5	4	10
5% to 7%	10	2	7	19
7% to 9%	16	13	9	38
More than 9%	6	6	2	14