Annual Report
to the
Comptroller
on
Actuarial Assumptions

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Executive Summary

In March of 2015, pension cuts became a reality for an estimated 20,000 city of Detroit retirees. The consequences of inadequate pension funding are serious. New York State Retirement and Social Security Law (RSSL) Section 11 directs the Actuary for the New York State and Local Retirement Systems (NYSLRS), comprised of the Employees Retirement System (ERS) and Police and Fire Retirement System (PFRS), to provide a quinquennial report on the Systems' experience and to propose assumptions and methods for the actuarial valuations. If the actuarial assumptions are reasonable, and the actuarially determined contributions are collected in a timely manner, then NYSLRS' pensioners and beneficiaries can have confidence that their benefits are secure.

The previous quinquennial study was ushered in by the Great Recession. The assumed rate of return on investments was decreased from 8.0% to 7.5%. The five year rate of return since that time was 10.2%. However, a portion of that return is due to equity markets rebounding from oversold positions, and a portion is owing to the Federal Reserve's support of investment markets. The rebound is over, and the support likely to be phased out. The assumed rate of return drop was prudent. Now that five years have passed, the time frame provided in the RSSL, the biggest question becomes, should the assumption be reduced again?

The phrase, 'past performance is not an indicator of future results' is commonly found in the boilerplates of financial literature. Unfortunately, investment performance crystal balls are not available. We have history, and we have prognostications. During my college training in atmospheric science, particularly weather forecasting, I observed that those who liked snow were tempted to see a Nor'easter in every potential coastal disturbance, while those who hated snow would wear out the phrase "out to sea". When predicting the future, it's hard not to see what you prefer.

Happily, successful pension funding does not rely on the rate of return assumption coming to fruition. With each valuation, investment gains or losses are folded into the calculations leading to increased or decreased contributions beginning with the next set of employer contribution rates. The aggregate funding method assures that the investment gain or loss is disbursed or recouped over the remaining working lifetime of the valuation cohort, preserving intergenerational equity. The asset valuation method facilitates a smoothing of the employer contribution rates.

Nevertheless, superior funding seeks to minimize gains and losses as this provides the most level allocation of benefit costs and the greater likelihood of smooth employer contribution rates. Thus it is in the best interest of funding to procure unbiased investment return expectations for all applicable asset classes in the investment policy and set the rate of return assumption accordingly, mindful that pension funding is a long-term endeavor and that changes need not and ought not be rash, but measured and meaningful in the direction of the expected trend.

EXECUTIVE SUMMARY

This study marks the first time that there has been a concerted effort to coordinate the Pension Investments and Cash Management (PICM) asset allocation study with the actuarial quinquennial assumption review. In so doing, I possess the capital market assumptions and portfolio expectations of NYSLRS' investment professionals and consultants. These assumptions are regarded to be applicable to a ten-year time frame and are net of investment fees and expenses. Pension funding has a significantly longer time horizon. Nevertheless, I believe the PICM asset allocation study to be the best set of information from which to recommend a rate of return assumption.

In addition, this report recommends changes in most of the significant valuation assumptions, as is typical in the quinquennial year. These recommendations are made with an eye towards the continually evolving Actuarial Standards of Practice (ASOPs).

Finally, this set of contribution rates is made with two notable changes in the billing process. Billing process changes do not modify a system's liabilities, rather they modify the present value of billing salary over which the necessary employer contributions are collected.

The first change is a result of a decision by the head of the Retirement System to subject to billing all pensionable salary provided in a fiscal year. For many years, pensionable salary was only billed if the employee was still actively on the payroll on the last day of the fiscal year. Thus a member could retire on the last day of the fiscal year, and the final year's salary was not billed. This was accounted for in the valuation and the determination of rates, however, the new policy is more equitable for the employers.

The second billing process change is to apply billing rates to salaries as of the end of the previous fiscal year, rather than the end of the fiscal year when the contributions are made. This required a change to the RSSL. Chapter 94 of the Laws of 2015 eliminates billing reconciliations, which employers found confusing and/or inconvenient. Further, employer bills will now be known months in advance, which should facilitate budgeting for the employers. Like the first change, this also has the effect of increasing the present value of the future billing salary base.

A new gain/loss section in the quinquennial report will quantify the rate impact of the various categories of change and experience. This will assist the reader in assessing the relative importance of the various components.

By the end of the report the persevering reader will find that the average employer contribution rate that emerges from the new assumptions and billing procedures is about 15% lower in ERS and 4% lower in PFRS than the previous rates. I recommend adopting these new assumptions beginning with the April 1, 2015 valuation, which generates employer contribution rates for fiscal year 2017.

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Economic Assumptions

Inflation (CPI-U) and the Cost of Living Adjustment

Prices for goods and services vary over time. If a "basket" of goods and services is held constant, its change in price over time is attributed to a change in the value of the currency. The Federal Bureau of Labor and Statistics (BLS) measures and tracks this phenomenon. Its Consumer Price Indexes (CPI) program produces monthly data on changes in the prices paid by consumers for a representative basket of goods and services.

The BLS publishes a multitude of CPI indexes each month, including the headline All Items CPI for All Urban Consumers (CPI-U) and the CPI-U for All Items Less Food and Energy. The latter series, widely referred to as the "core" CPI, is closely watched by many economic analysts and policymakers under the belief that food and energy prices are volatile and are subject to price shocks that cannot be damped through monetary policy. However, all consumer goods and services, including food and energy, are represented in the headline CPI-U.

A general and progressive increase in prices is called inflation.
A general and progressive decrease in prices is called deflation.

Our recent history is predominantly marked by varying levels of inflation, with occasional brief episodes of deflation. Inflation reduces the buying power of consumers with a fixed income, as is often the case with pensioners and beneficiaries.

To mitigate this loss, Chapter 125 of the Laws of 2000 established a permanent COLA program first implemented in September, 2001. The program provides an annual COLA (each September) equal to one-half of the CPI-U increase for the previous fiscal year (April through March). The COLA is rounded to the next highest 0.1%, and then subject to a 1% floor and a 3% ceiling. The COLA applies to the first $18,000 of benefit for pensioners and accidental death benefit recipients, with most spousal beneficiaries provided 50% of the pensioner's COLA.

The actuarial valuation must estimate future COLAs, which is done by means of a COLA assumption. The table below provides CPI-U data for the last two decades and COLA data for the last decade. Note that the BLS added digits to the CPI-U beginning January 2007.

ECONOMIC ASSUMPTIONS

FY Ending 3/31	CPI-U	% Increase	COLA	FY Ending 3/31	CPI-U	% Increase	COLA
1990	128.7			2003	184.2	3.02	1.6
1991	135.0	4.90		2004	187.4	1.74	1.0
1992	139.3	3.19		2005	193.3	3.15	1.6
1993	143.6	3.09		2006	199.8	3.36	1.7
1994	147.2	2.51		2007	205.352	2.78	1.4
1995	151.4	2.85		2008	213.528	3.98	2.0
1996	155.7	2.84		2009	212.709	-0.38	1.0
1997	160.0	2.76		2010	217.631	2.31	1.2
1998	162.2	1.38		2011	223.467	2.68	1.4
1999	165.0	1.73		2012	229.392	2.65	1.4
2000	171.2	3.76		2013	232.773	1.47	1.0
2001	176.2	2.92	1.5	2014	236.293	1.51	1.0
2002	178.8	1.48	1.0	2015	236.119	-0.07	1.0

The annualized increase in the CPI-U over the twenty-five year period is given by:

$$(236.119 / 128.7) \wedge (1 / 25) - 1 = 2.46\%, \text{ which rounds to } 2.5\%$$

We now test whether this is a reasonable assumption for projecting future COLAs (which may differ from CPI-U due to the 1% floor and 3% ceiling).

A valuation inflation assumption of 2.5% would project COLAs of 1.3% for all future years (2.5% / 2 = 1.25% rounded up to 1.3%).

This projection would have properly valued the accumulated COLAs over the previous 15 years:

$$1.015 * 1.010 * 1.016 * 1.010 * 1.016 * 1.017 * 1.014 * 1.020 * 1.010 * 1.012$$
$$* 1.014 * 1.014 * 1.010 * 1.010 * 1.010 - 1 = 21.73\%$$

The level COLA, rounded to tenths of a percent, that best matches this experience is 1.3%.

$$1.012 \wedge 15 - 1 = 19.59\%$$

$$1.013 \wedge 15 - 1 = 21.38\%$$

$$1.014 \wedge 15 - 1 = 23.19\%$$

Therefore I recommend that we change the valuation inflation assumption from the current value of 2.7% to 2.5%.

ECONOMIC ASSUMPTIONS

Investment Rate of Return

The actuarial investment rate of return assumption (*i*) is an assumption concerning the long-term (i.e. 30 year) rate of return on pension plan assets. It is used to discount the value of future projected contributions and projected benefits.

The concept of discounting is perhaps best understood by way of illustration. Consider the following question:

> Who is older, person A, age 50 today, or person B, age 62 ten years from now?

We trust that you answered person B. You probably arrived at your answer by adding ten years to person A's age and comparing 60 with 62, or by subtracting ten years from person B's age, and comparing 50 with 52. In either case, you brought the data to a common date and then made your comparison. You intuitively understood the "time value of age".

Now a second question:

> Assuming that you have an investment fund that has an annual rate of return of 7.5%, which is worth more, $100 today or $120 three years from now?

Your intuition may have led you to select $100 as you reasoned that even at simple interest, $100 earning 7.5% per year is worth $122.50 after three years.

At compound interest, $100 becomes $100 * 1.075 * 1.075 * 1.075 = $124.23

In both cases, as with the question about the ages, you brought the data to a common date and made your comparison. Except perhaps in this case you were more likely to bring the $100 forward in time (accumulating) than you were to bring the $120 backward in time (discounting).

To solve the problem by discounting, you would divide the $120 by 1.075 three times.

$$(($120 / 1.075) / 1.075) / 1.075 = $96.60$$

These calculations illustrate the concept of the "time value of money". And hopefully the exercise has illustrated the importance of the discount rate. Your answer would have been different if your investment fund had an annual rate of return of 5%.

Actuarial valuations generally rely on discounting projected cash flows to a valuation date.
The valuation projects benefits for over a million people, with the most distant benefit about 110 years down the road (for a baby beneficiary). This projected cash flow is discounted at 7.5% to arrive at the present value of future benefits (PVBs).

The valuation also projects employee contributions and billing compensation, all of which are discounted back to the valuation date.

And so it is easy to see the importance of the assumed investment return assumption. If the assumption is too optimistic then there will be more investment losses than gains and contributions to the fund will be less timely. If the assumption is too pessimistic then there will be more investment gains then losses and contributions to the fund will be front-loaded.

As for this study's recommendation, we begin with a history of the assumption.

FY	%	FY	%	FY	%	FY	%	FY	%	FY	%	FY	%	FY	%
70	4.87	75	5.50	82	7.50	86	8.00	89	8.75	97	8.50	01	8.00	11	7.50
71	4.87	76	5.50	83	7.50	87	8.00	90	8.75	98	8.50	02	8.00	12	7.50
72	4.87	77	5.50	84	7.50	88	8.00	91	8.75	99	8.50	03	8.00	13	7.50
73	4.87	78	5.50	85	7.50			92	8.75	00	8.50	04	8.00	14	7.50
74	4.87	79	5.50					93	8.75			05	8.00	15	7.50
		80	5.50					94	8.75			06	8.00		
		81	5.50					95	8.75			07	8.00		
								96	8.75			08	8.00		
												09	8.00		
												10	8.00		

NYSLRS has a track record of not adjusting this assumption very frequently (7 times in 46 years), which is consistent with our long-term (30 year) funding perspective.

The NYSLRS historical returns by fiscal year (since 1981, the first year of serious commitment to equities) are as follows:

Year	Return	Year	Return	Year	Return	Year	Return
81	16.7%	91	11.7%	01	-8.7%	11	14.6%
82	3.3%	92	10.7%	02	2.8%	12	6.0%
83	21.4%	93	12.5%	03	-10.2%	13	10.4%
84	7.9%	94	6.9%	04	28.8%	14	13.0%
85	13.7%	95	8.8%	05	8.5%	15	7.2%
86	24.0%	96	21.8%	06	14.6%		
87	17.8%	97	10.9%	07	12.6%		
88	1.6%	98	30.4%	08	2.6%		
89	13.4%	99	8.8%	09	-26.4%		
90	13.9%	00	17.8%	10	25.9%		

ECONOMIC ASSUMPTIONS

This produces the following time-weighted annualized returns (gross of expenses):

Period	Annualized Return
2011-2015: 5 years	10.2%
2006-2015: 10 years	7.1%
2001-2015: 15 years	5.9%
1996-2015: 20 years	8.7%
1991-2015: 25 years	9.0%
1986-2015: 30 years	9.8%
1981-2015: 35 years	10.2%

While the 7.5% return has been met over the longer time periods, markets have been much more challenging since the year 2000.

What can be said about the view looking forward?

On March 27, 2015, the Division of Pension Investment and Cash Management (PICM) issued their asset allocation study and asset allocation policy. The portion of the report most germane to the actuarial rate of return assumption is repeated below:

Asset Class	(A) Allocation	(B) Arithmetic Return Assumption	Standard Deviation Assumption	(A) * (B)
Broad US Equity	38%	7.30%	17.85%	2.774%
Broad International Equity	13	8.55	20.55	1.112
Int. Duration Fixed Income	15	4.00	6.21	0.600
CRF Non-Core FI	3	5.75	10.02	0.173
TIPS	2	4.00	6.39	0.080
Core Real Estate	2	7.00	12.54	0.140
Non-Core Real Estate	6	10.00	22.50	0.600
Diversified Hedge Funds	3	6.75	9.94	0.203
CRF Private Equity	10	11.00	25.03	1.100
CRF Real Assets	3	8.65	14.96	0.260
CRF Opportunistic	3	8.60	14.01	0.258
Cash Equivalents	2	2.25	3.02	0.045
			Expected Arithmetic Return	7.345

The capital market assumptions used in the report are applicable to a ten-year time frame and are net of investment fees and expenses.

ECONOMIC ASSUMPTIONS

The expected arithmetic return for this portfolio is 7.34%, with a standard deviation of 12.88%, for a geometric return of 6.58%. (The expected arithmetic return is computed in the last column. Correlation coefficients are required to duplicate the portfolio standard deviation, and higher level math to duplicate the geometric return, both of which are beyond the scope of this report.)

The actuarial bureau does not have the expertise to meaningfully comment on the capital market assumptions above, and the correlation coefficients between asset classes given in the PICM report. We do have the expertise to take these capital market assumptions and correlation coefficients and enter them into our in-house stochastic simulation model to confirm the portfolio expectations provided by the investment consultant, and generate additional statistics of interest (namely over time periods longer than ten years) when setting the recommended rate of return assumption.

Though not without some controversy and professional discussion beyond the scope of this paper, the geometric return is generally regarded as the appropriate target for the assumed investment rate of return to be consistent with the application of compound interest.

This is easily understood by example. In FY 2009, NYSLRS investment return was -26.4%. In the year that followed it was 25.9%. The arithmetic average of these two years is approximately 0. This does not mean however, that FY 2010 recouped all of the FY 2009 losses. The geometric return for the two years was $(1 - 26.4\%) * (1 + 25.9\%) - 1 = -7.3\%$, or -3.7% annually.

If smooth employer contribution rates were of no concern, then it might be sensible to recommend an assumption reduction of 0.9% to 6.6%. However, we do have a funding objective of smooth employer contribution rates and I am concerned that such a precipitous reduction leans in the direction of being rash. On the other hand, I am concerned that a reduction from 7.5% to 7.25% leans in the direction of not being attentive enough to the asset allocation study.

The in-house stochastic model projects that 42.1% of the (150,000) 30-year periods projected would have a geometric return of 7.0% or greater. I think that this is an acceptable assumption for the next five years (assuming no dramatic changes in asset allocation policy or capital market assumptions – see Appendix C for a schematic of the process) as it brings the assumption more than half way towards the expected geometric return of the new asset allocation policy. I regard this to be both a measured and meaningful adjustment.

Therefore, I recommend a change in the investment return assumption from the current 7.5% to 7.0%.

In response to those who do not regard the reduction to be enough, it is important to remember the following:
- the long-term perspective of the assumption (30 years, in 5 years another change can be made)
- the long-term nature of governments (private sector entities are more exposed to expiration)
- the large size of the trust and the efficiency of a sole trustee
  (which allow the fund to discover and take timely advantage of investment opportunities)
- the Fund's March 31, 2015 invested assets exceeds its net annual cash flow by about 42 times
  (which provides an investment horizon that is significantly longer than typical market cycles)
  [See Appendix A, FY2015: $184.5 / ($10.5 - $6.1) = 42]

With these advantages, patience can be exercised in the adjustments of the investment return assumption with the future quinquennial studies providing additional opportunities to adjust further if conditions warrant.

Finally, consideration should be given to the position of other public retirement systems. In May, 2015, a National Association of State Retirement Administrators Issue Brief titled "Public Pension Plan Investment Return Assumption" presented the following investment return assumption distribution for public systems:

i	Number of Public Systems	
	May 2015	March 2010
< 7.00	4	0
7.00	4	1
7.01-7.50	43	21
7.51-7.99	36	16
8.00	34	51
8.01-8.49	3	16
8.50	2	19
Median	7.75	7.97

Thus, a change from 7.5% to 7.0% will mean that NYSLRS has one of the lowest assumed rates of return among public systems. However, given the market performance since 2000, it seems likely that other systems will be contemplating assumed investment rate of return reductions.

(DC Police and Fire & DC Teachers are at 6.50%, Indiana PERF & Indiana Teachers are at 6.75%, Virgina Retirement System, Texas Municipal, Idaho PERS, & New York City ERS are at 7.00%)

Salary Scales

The salary scale is the assumed annual rate of salary increase. It is used to project an individual's final average salary and benefit. The current assumptions are indexed by system and age. The ERS regular plan assumptions are based upon ERS regular plan experience. The PFRS assumptions are based upon all PFRS experience. The PFRS assumptions are applied to ERS special plans. ERS special plan experience is ignored as sporadic contract settlements lead to volatility. The current assumptions are in the table below:

Srv	ERS	PFRS	Srv	ERS	PFRS	Srv	ERS	PFRS	Srv	ERS	PFRS
0	10.30%	29.76%	11	4.72%	4.62%	22	3.86%	4.24%	33	3.61%	4.08%
1	8.68	29.76	12	4.60	4.46	23	3.81	4.18	34	3.58	4.08
2	7.49	18.33	13	4.52	4.33	24	3.81	4.15	35	3.56	4.08
3	6.69	12.19	14	4.48	4.32	25	3.81	4.22	36	3.53	4.08
4	6.21	9.11	15	4.40	4.41	26	3.79	4.36	37	3.51	4.08
5	5.92	7.41	16	4.31	4.57	27	3.77	4.50	38	3.47	4.08
6	5.70	6.34	17	4.24	4.74	28	3.74	4.54	39	3.43	4.08
7	5.49	5.73	18	4.19	4.82	29	3.71	4.41	40+	3.36	4.08
8	5.27	5.36	19	4.14	4.68	30	3.68	4.24			
9	5.05	5.09	20	4.06	4.42	31	3.66	4.12			
10	4.86	4.85	21	3.95	4.28	32	3.63	4.08			

The assumptions above were based on the patterns of increase in the 2006-2010 study and resulted in a total overall salary scale (for the April 1, 2010 cohort) of 4.9% in ERS and 6.0% in PFRS. The salary scales decreased with the ensuing cohorts, particularly in PFRS, due to shifting demographics (i.e. a smaller percentage of employees at the lower service levels where the higher salary scale rates are applied).

The table below provides a history of the assumption since fiscal year 1980 (the first year for which a total overall salary scale was computed). Distinctions between systems began in 1997.

FY		FY		FY	ERS	PFRS	FY	ERS	PFRS	FY	ERS	PFRS
80	5.0%	89	7.0%	97	6.0%	6.5%	02	5.9%	6.9%	11	4.9%	6.0%
81	5.0	90	7.0	98	6.0	6.5	03	5.9	6.9	12	4.9	5.7*
82	8.5	91	7.0	99	6.0	6.5	04	5.9	6.9	13	4.8*	5.4*
83	8.5	92	7.0	00	6.0	6.5	05	5.4	6.9	14	4.8	5.4
84	8.5	93	7.0	01	5.5	6.0	06	5.4	6.9	15	4.8	5.4
85	8.5	94	7.0				07	5.4	6.8	*decrease due to		
86	8.5	95	7.0				08	5.4	6.8	changes in cohort,		
87	7.3	96	7.0				09	5.4	6.8	not assumptions		
88	7.3						10	5.4	6.8			

NYSLRS has a track record of adjusting the salary scale assumption only slightly more frequently than the assumed investment return assumption (9 times in 35 years).

The actual overall salary scale over the period April 1, 2010 to March 31, 2015 was 3.3% in ERS and 4.5% in PFRS.

The current economic climate and disposition towards civil service wages does not portend a reversal of the pattern of low wage growth, and I think the salary scales can be dramatically reduced.

Like the investment rate of return assumption, the salary scale assumption is long term. However, the term is not the same. I regard the term of the investment rate of return to be the average remaining lifetime of the participants (both active and pensioner), which is about 30 years. I regard the term of the salary scales to be the average remaining working lifetime of the active participants, which is about 11 years in ERS and 13 years in PFRS. Thus, I assert that near term considerations should carry more influence in the setting of the salary scale than in the setting of the investment rate of return.

Therefore, strongly influenced by the past 5-years' experience and the current salary malaise, I recommend reducing the ERS total overall salary scale by 1.0% (to an April 1, 2015 value of 3.8%) and the PFRS salary scale by 0.9% (to a value of 4.5%).

I have also simplified the salary scale as the extra digit and hair-splitting in the higher service years adds little value. The results are as follows:

Srv	ERS	PFRS	Srv	ERS	PFRS
0	8.0%	27.0%	10	3.8%	4.1%
1	8.0	27.0	11	3.7	4.0
2	7.0	13.5	12	3.6	3.9
3	6.0	11.5	13	3.5	3.8
4	5.0	9.5	14	3.4	3.7
5	4.5	7.5	15	3.3	3.6
6	4.2	5.3	16	3.2	3.5
7	4.1	4.4	17	3.1	3.4
8	4.0	4.3	18+	3.0	3.3
9	3.9	4.2			

Alternatively, we can look at these salary scale recommendations in a building block fashion.

Component		Proposed			Current	
		ERS	PFRS		ERS	PFRS
Wage Inflation	CPI-U (Price Inflation)	2.5%	2.5%		2.7%	2.7%
	Group Productivity Gains	0.5%	0.5%		0.8%	0.8%
	Individual Merit (Steps & Promotion)	0.8%	1.5%		1.4%	2.5%
	Total	3.8%	4.5%		4.9%	6.0%

The new salary scales reflect a reduction in the assumed price inflation and a reduction in the negotiating leverage to be compensated for group-based productivity gains.

Finally, we examine the spread between the assumed investment rate of return and the salary scale, and the assumed investment rate of return and the wage inflation.

	Salary Scale Spread				Wage Inflation Spread			
	Proposed		Current		Proposed		Current	
	ERS	PFRS	ERS	PFRS	ERS	PFRS	ERS	PFRS
Assumed Return	7.0%	7.0%	7.5%	7.5%	7.0%	7.0%	7.5%	7.5%
Salary Scale	3.8%	4.5%	4.8%	5.4%				
Wage Inflation					3.0%	3.0%	3.5%	3.5%
Spread	3.2%	2.5%	2.7%	2.1%	4.0%	4.0%	4.0%	4.0%

In general, reductions in the assumed investment return should be accompanied by reductions in the salary scale as an economy that struggles to generate profits is also likely to be an economy in which it is a struggle to sustain wage growth.

In their last report, Buck noted survey results that showed that the difference between the assumed rate of return and the wage inflation component of the salary scale ranged from 2.80% to 5.45%. Buck concluded that "the System's spread of 4.00% is very reasonable compared to those shown in the survey." The proposed assumptions maintain this spread at 4.00% for both systems.

Asset Valuation Method

Pension fund managers could direct all assets to be invested in a fixed income portfolio. While this would greatly reduce investment income volatility, it would also increase the expected employer contribution rates.

In general, one expects to profit more as an owner (i.e. an investor in equities) than as a lender (i.e. an investor in bonds), especially if the equity ownership can be diversified and held. Thus pension funds invest in equity index funds. Unfortunately, this introduces volatility in investment income.

The basic equation governing pension funding is: C + I = B + E

where, C = contributions (both employer and employee)
       I = investment income
       B = benefits
       E = expenses [In NYSLRS, administrative expenses are funded independently of the benefits.]

From the basic equation it is clear that volatility in investment income translates into volatility in employer contributions.

Asset valuation methods "smooth" the investment income volatility by phasing in "unexpected" gains and losses, where the "unexpected" and the period of smoothing are defined by the method.

The NYSLRS asset valuation method was revised in 2013 and has the following features:
1) expect a gain of the assumed rate of return on the plan net position and fiscal year cash flows,
2) recognize (smooth) the unexpected gain (= actual gain – expected gain)
   over 5 years in equal annual portions, beginning immediately
3) do <u>not</u> apply a market value corridor.

I recommend that we maintain the current asset valuation method.

ASSET VALUATION METHOD

The market and actuarial value of assets (MVA & AVA) , along with the entry age normal accrued liability (AL_{EAN}), the entry age normal unfunded accrued liability (UAL_{EAN}), and the GASB 25 funded ratio (AVA/AL_{EAN} now obsolete) since FY 2000 are given below (in billions).

The traditional funded ratio is no longer required by GASB. It has been replaced by the ratio of the plan net position (MVA) to the entry age normal total pension liability (TPL_{EAN}). This new nameless ratio (GASB promulgates disclosure requirements, not funding requirements, and now takes greater care in labeling) which uses the MVA instead of the smoothed AVA used for funding, will prove much more volatile than the traditional funded ratio, as can be seen if we use AL_{EAN} as a proxy for TPL_{EAN}. Note that in 2015, AL_{EAN} is not equal to TPL_{EAN} as the latter is rolled forward from the 2014 AL_{EAN} to provide sufficient time for financial statement auditors.

FY	MVA[a]	AVA	AL_{EAN}	UAL_{EAN}	GASB 25 Ratio	TPL_{EAN}	GASB 67 Ratio
2000	$128.9	$110.6	$90.6	$-20.0	**122.1**%		**142.3**%
2001	114.0	119.4	98.0	-21.4	121.9		116.3
2002	112.7	125.1	103.9	-21.2	120.4		108.5
2003	97.3	106.6	107.3	0.6	99.4	Use AL_{EAN} as a proxy	90.7
2004[b]	120.8	117.4	116.2	-1.2	101.0		104.0
2005	128.0	123.7	120.0	-3.7	103.1		106.7
2006	142.6	132.0	126.6	-5.4	104.3		112.6
2007	156.5	142.5	134.6	-7.9	105.9		116.3
2008	155.8	151.7	141.3	-10.4	107.4		110.3
2009	110.9	148.9	146.7	-2.1	101.5		**75.6**
2010	134.2	147.7	156.6	8.9	94.3		85.7
2011	149.5	148.6	164.3	15.7	90.5		91.0
2012	153.3	147.8	169.3	21.5	**87.3**		90.5
2013	164.1	155.3	175.1	19.8	88.7		93.7
2014	181.2	171.6	186.1	14.6	92.2		97.4
2015	189.3	184.2	196.5	12.4	93.7	$193.1	98.0
a) Financial Statement Plan Net Position (i.e. Invested Assets + Receivables) [both the MVA & AVA exclude funds for group term life insurance]							
b) The equity smoothing was 'restarted'; MVA > AVA as the market value of the fixed income portfolio exceeded the amortized cost.							

Demographic Assumptions

Pensioner Mortality Experience

The most significant demographic assumption is pensioner mortality. Our pensioner mortality tables are not developed on a "by number" basis, but on a "by liability" basis.

For example, a pensioner mortality rate of 1% for age 65 pensioners does not mean that we expect 1 in every 100 age 65 pensioners to expire within the year, rather it means that we expect $1 in every $100 age 65 pensioner liabilities to expire within a year.

By liability is preferred over by number because the valuation is concerned with the cessation of benefit obligations, not necessarily the cessation of benefit recipients. Generally, mortality by number and mortality by liability should be roughly equivalent. However, experience studies have shown that pensioners with more lucrative benefits enjoy better longevity than those with lesser benefits. Thus a by number mortality table would undervalue the present value of future benefits.

A second feature of the pensioner mortality assumption is the inclusion of a projection regarding mortality improvement. In 2014 we adopted the Society of Actuaries MP-2014 for this purpose.

I recommend that we use the April 1, 2010 through March 31, 2015 pensioner experience, with mortality improvement using the Society of Actuaries Mortality Projection Scale MP-2014.

The tables below provide some sample values of the pension liability mortality per $1,000 in pensioner liability for valuation date April 1, 2015. (Additional pensioner mortality details can be found in Appendix B.)

Ideally, the ratios of "actuals" to "expected" (A/Es) is near 1 (i.e. the "expecteds" were a good estimate of the "actuals"). Thus the 2015 A/E is closer to 1 than the 2010 A/E as the 2015 assumptions are developed from the 2010 to 2015 experience.

ERS Service Retirement Pension Mortality per $1,000								
	Clerk (White Collar)					Laborer (Blue Collar)		
	Male		Female			Male		Female	
Age	'15	'10	'15	'10		'15	'10	'15	'10
55	$5.0	$6.1	$3.7	$3.2		$5.5	$7.4	$4.0	$5.2
62	7.5	7.4	5.3	6.5		10.6	10.8	6.1	7.4
65	8.7	9.4	6.7	8.2		14.1	15.9	8.1	10.1
70	13.6	17.0	10.6	13.3		21.7	23.5	13.4	15.3
80	44.0	45.3	31.3	35.9		57.3	65.1	36.9	36.4
90	143.7	149.5	113.3	117.9		172.9	177.9	123.7	122.4
Annuity Values (by liability)								
55	12.158	11.565	12.567	11.750		11.695	11.096	12.378	11.562
62	11.114	10.902	11.599	10.810		10.433	9.956	11.324	10.630
65	10.528	10.005	11.057	10.313		9.805	9.337	10.748	10.113
2010-2015 Experience A/E Ratios								
All	0.989	1.100	0.987	1.048		0.990	1.071	0.988	1.099

ERS Disability Retirements Pension Mortality per $1,000				
	Male		Female	
Age	'15	'10	'15	'10
55	$25.5	$31.7	$28.0	$32.1
62	31.5	27.0	25.2	27.3
65	33.9	31.8	24.9	27.3
70	39.6	34.3	28.6	29.3
80	73.0	85.4	61.0	57.5
90	190.5	168.4	150.9	139.3
Annuity Values (by liability)				
55	9.804	9.528	10.258	9.651
62	9.007	8.756	9.779	9.189
65	8.599	8.211	9.370	8.861
2010-2015 Experience A/E Ratios				
All	0.998	1.059	0.997	1.085

PFRS Retirements Pension Mortality per $1,000				
	Service		Disability	
Age	'15	'10	'15	'10
55	$2.8	$3.8	$3.9	$7.5
62	5.9	7.2	7.2	9.8
65	7.9	9.8	9.5	13.4
70	13.4	15.8	16.6	14.8
80	46.9	57.2	57.6	58.7
90	172.6	142.3	159.7	148.7
Annuity Values (by liability)				
55	12.278	11.554	12.034	11.213
62	11.080	10.403	10.791	10.141
65	10.443	9.804	10.127	9.585
2010-2015 Experience A/E Ratios				
All	0.993	0.974	1.043	0.946

Beneficiaries Pension Mortality per $1,000				
	Male		Female	
Age	'15	'10	'15	'10
55	Same as male clerk service.*	Same as male clerk service.*	$4.8	$2.9
62			7.5	8.9
65			9.1	10.0
70			13.4	13.9
80			37.7	38.9
90			113.9	119.2
Annuity Values (by liability)				
55	See males	See males	12.500	11.618
62			11.577	10.601
65			11.079	10.118
2010-2015 Experience A/E Ratios				
All	1.278	1.470	0.987	1.141

*Notes: 1. Male beneficiaries use male clerk (white collar) table.
2. The active valuation assumes all beneficiaries will be female.

Active Member Decrement Experience

The 30 active valuation decrements are as follows:

Decrement	ERS study group (all service is for mid-year)		PFRS study group	also applies to	Name
Withdrawal	0.00 ≤ service ≤ 1.99				WDME01
	2.00 ≤ service ≤ 2.99				WDME2
	3.00 ≤ service ≤ 3.99				WDME3
	4.00 ≤ service ≤ 4.99				WDME4
	5.00 ≤ service ≤ 9.99				WDME59
	10.00 ≤ service				WDMEV
			All P&F		WDMP
Accidental Death	All ERS				ADMERS
			All P&F		ADMPF
Ordinary Death	All ERS		Pens. mortality to age 45 disab age 50 srv/ben		ODMERS
		All P&F	Pens. mortality to age 45 disab & srv/ben		ODMPF
Accidental Disability	Tiers 1 & 2				AIMERST12
	Tiers 3, 4, 5 & 6				AIMERST345
		All P&F	200%: cntypd75 100%: 14-b, shta 50%: State COs, 89w 25%: UCPOs		AIMPF
Ordinary Disability	All ERS				OIMERS
		All P&F			OIMPF
IPOD Retirement		All P&F	ERS 14-B		IPODPF
Service Retirement	Tier 1, service ≤ 19.99		P&F T-1 regular plans		OR55LT20T1
	T-1, 20.00 ≤ service ≤ 29.99				OR552029T1
	T-1, 30.00 ≤ service				OR55GE30T1
	T-2,3,4, service ≤ 19.99		P&F T-2 reg pl, ERS T-5		OR55LT20T234
	T-2,3,4 20.00 ≤ serv ≤ 29.99				OR552029T234
	T-2,3,4, 30.00 ≤ yr service				OR55GE30T234
	25 yr plan (T-3,5 State COs)		P&F T-2 25 yr		OR25SC
	25 yr + 60ths (T-1,2 state COs)		P&F 25 + 60ths		OR25p60SC
	25 yr w A15 (county COs)		P&F T-1 25 yr, ERS 25yr& 80a		OR2589E
		20 year plan	ERS 20 yr		OR20
		20 yr + 60ths (State Police)			OR20SP
		20 yr + 60ths (not St Pol)	ERS 20 + 60ths		OR20p60
		20 yr (P&F A14)			ORPFA14

I recommend that we update all the active member decrement assumptions based on the experience from April 1, 2010 through March 31, 2015.

DEMOGRAPHIC ASSUMPTIONS

The table below provides some values of the expected withdrawal decrements per 1,000 members (in a single decrement context). Withdrawals for ERS with service < 4 years were higher than expected. Withdrawals for ERS with Service ≥ 4 years and for PFRS were generally as expected.

	Withdrawals													
	ERS (WDME)												PFRS (WDMP)	
	0 ≤ Srv < 2		2 ≤ Srv < 3		3 ≤ Srv < 4		4 ≤ Srv < 5		5 ≤ Srv < 10		10 ≤ Service				
Age	'15	'10	'15	'10	'15	'10	'15	'10	'15	'10	'15	'10	Srv	'15	'10
20	223	183	122	103	74	68	64	59	43	43	15	28	0	69	74
30	147	147	126	112	98	97	74	80	43	46	16	26	5	12	12
40	131	123	93	81	70	68	55	58	39	40	17	18	10	6	5
50	126	116	78	69	61	56	50	46	32	31	13	13	15	3	4
60	134	126	93	76	73	65	56	48	24	29	0	0	20	0	0
65	148	138	105	82	81	68	59	53	19	30	0	0	25	0	0
	2010-2015 Experience A/E Ratios														
All	0.971	1.094	1.003	1.159	1.006	1.063	1.003	1.015	1.005	0.989	1.008	0.992	All	1.002	1.023

The table below provides some values of the expected death decrements per 1,000 members (in a single decrement context). Happily our death expectations were too high.

	Deaths							
	ERS				PFRS			
	Accidental Death (ADMERS)		Ordinary Death (ODMERS)		Accidental Death (ADMPF)		Ordinary Death (ODMPF)	
Age	'15 Tbls	'10 Tbls	'15 Tbls	'10 Tbls	'15 Tbls	'10 Tbls	'15 Tbls	'10 Tbls
20	0.01	0.01	0.32	0.45	0.08	0.08	0.32	0.35
30	0.01	0.01	0.36	0.55	0.08	0.08	0.32	0.35
40	0.01	0.01	0.68	0.89	0.08	0.08	0.36	0.38
50	0.01	0.01	1.44	1.64	0.08	0.08	0.83	0.93
60	0.01	0.01	2.15	2.94	0.06	0.06	4.54	5.14
65	0.01	0.01	3.07	4.63	0.06	0.06	6.69	7.54
	2010-2015 Experience A/E Ratios							
All	0.173	0.161	1.000	0.815	1.004	0.984	0.996	0.732

DEMOGRAPHIC ASSUMPTIONS

The table below provides some values of the expected disability decrements per 1,000 members (in a single decrement context).

Disability Retirements									
	ERS				PFRS				
	Accidental Disability (AIMERST3456)		Ordinary Disability (OIMERS)		Accidental Disability (AIMPF)		Ordinary Disability (OIMPF)		IPOD Disability (IPODPF)	
Age	'15	'10	'15	'10	'15	'10	'15	'10	'15	'10
20	0.01	0.01	0.49	0.67	0.42	0.44	0.47	0.23	0.11	0.23
30	0.01	0.01	0.49	0.67	0.42	0.44	0.47	0.23	0.23	0.23
35	0.03	0.02	0.86	0.67	1.29	1.75	0.47	0.23	0.89	1.04
40	0.04	0.06	1.07	1.52	2.26	3.74	0.38	0.23	1.96	2.22
45	0.05	0.07	2.10	2.29	3.37	4.73	0.47	0.55	3.25	2.50
50	0.05	0.07	3.45	3.82	3.75	4.42	0.92	1.70	3.47	3.01
2010-2015 Experience A/E Ratios									
All	0.852	0.635	1.019	0.872	0.985	0.768	1.009	0.966	1.015	1.110

The table below provides some values of the expected ERS regular plan service retirement decrements per 1,000 members (in a single decrement context). The display for tier 1 has been dropped as it now makes up less than one percent of the system.

The average age at retirement for regular plan members remained at 61 years.

ERS Regular Plan Service Retirements						
Tiers 2, 3, 4, 5 & 6 (OR55...T234)						
	'15 Tables			'10 Tables		
Age	0-19.99 yrs	20-29.99	> 30 yrs	0-19.99 yrs	20-29.99	> 30 yrs
55	55	93	397	59	82	418
60	53	82	192	49	78	200
62	139	317	297	149	321	360
65	153	253	205	158	258	277
2010-2015 Experience A/E Ratios						
All	1.000	1.000	1.000	1.001	1.078	0.911

The table below provides some values of the expected ERS and PFRS special plan service retirement decrements per 1,000 members (in a single decrement context). The display for ERS tier 1 and 2 has been dropped as it now makes up less than two percent of the system.

The average years of service for tier 3 state correction officers increased from 27 to 28, and for county correction officers it decreased from 30 to 29.

The average years of service for a PFRS 20 year plan retiree decreased from 26 to 25, while for a PFRS 20 year with additional 60ths plan it remained at 28 years, and for State Police it increased from 25 to 28 years. PF A14 is too new a plan to have any retirees in the study period (and thus no A/E ratios).

Special Plan Service Retirements											
	ERS 25 Year Plans Correction Officers (State & County) (OR25…)				PFRS 20 Year (OR20)		PFRS 20 Year w add'l 60ths (OR20p60)		State Police (OR20SP)		PF A14 (ORPFA14)	
	'15 Tables		'10 Tables		'15	'10	'15	'10	'15	'10	'15	'10
Srv	T-3	County	T-3	County								
20					229	217	89	84	62	80	20	20
25	253	236	278	198	77	119	71	54	81	67	571	571
30	146	206	137	119	73	94	163	168	200	177	400	400
35	189	274	207	185	133	209	224	306	220	91	400	400
2010-2015 Experience A/E Ratios												
Total	1.000	1.011	0.993	1.297	1.015	0.935	0.994	1.116	1.028	1.403	N/A	

Effect on Contributions

The table below summarizes the projected average employer contribution rates for the most recent valuations.

Valuation 4/1	Local Employer Billing Date 2/1	ERS (reg plan GLIP)	PFRS (GLIP)	Total Employer Contributions (billions)	Contribution Stabilization Program (CSP) Mitigated Rates (does not apply to GLIP)				CSP Balance (billions)
2005	2007	10.7%	17.0%	$2.7	ERS		PFRS		
2006	2008	9.6	16.6	2.6					
2007	2009	8.5	15.8	2.5					
2008	2010	7.3	15.1	2.3	Original		Original		
2009	2011	11.9 (0.4)	18.2 (0.1)	3.6	9.5%		17.5%		
2010	2012	16.3 (0.4)	21.6 (0.0)	4.9	10.5		18.5		
2011	2013	18.9 (0.4)	25.8 (0.1)	5.5	11.5	Alternate	19.5	Alternate	$0.3
2012	2014	20.9 (0.4)	28.9 (0.0)	6.2	12.5	12.0%	20.5	20.0%	1.1
2013	2015	20.1 (0.4)	27.6 (0.1)	6.1	13.5	12.0	21.5	20.0	2.1
2014	2016	18.2 (0.5)	24.7 (0.0)	5.5	14.5	12.5	22.5	20.5	3.3
2015	**2017**	**15.5 (0.4)**	**24.3 (0.0)**	**4.8**	**15.1**	**13.0**	**23.5**	**21.0**	**4.1**

In ERS the associated new entrant rate is 11.3%, and 15.5%/11.3% = 137%.
In PFRS the associated new entrant rate is 19.2%, and 24.3%/19.2% = 127%.

The associated new entrant contribution is $3.6b. The additional $1.2b is 9.7% of the UAL_{EAN} of $12.4b.

The new values for the "traditional" funded ratios are 93.8% in ERS and 93.2% in PFRS, up from 92.0% and 93.1% respectively.

Gain/Loss Analysis

	ERS	PFRS
2016 Estimated Contributions (2/1/16 Payment)	18.2%	24.7%
Changes Due to Gains/Losses In:		
Assumed Return Reduction Change [1]	6.3%	7.8%
Salary Scale	-2.5%	-3.1%
FY 2011 Investment Performance	-0.9%	-1.0%
FY 2012 Investment Performance	0.3%	0.3%
FY 2013 Investment Performance	-0.3%	-0.4%
FY 2014 Investment Performance	-0.8%	-0.9%
FY 2015 Investment Performance	0.1%	0.1%
Pensioner & Bene Mortality [2]	-2.0%	-0.8%
New Entrant	-0.7%	-0.9%
Billing Actual Salaries	-0.6%	-0.8%
Billing those who Decrement	-0.4%	-0.8%
Active Decrements [3]	-0.3%	0.8%
COLA	-0.4%	-0.3%
GLIP, Administrative Contributions	-0.1%	0.1%
Miscellaneous	-0.4%	-0.5%
Net Change	-2.7%	-0.4%
2017 Estimated Contributions (2/1/17 Payment)	15.5%	24.3%

1) Traditionally the contribution rates in the smaller PFRS vary more in response to most gains and losses.

2) The expected mortality improvement from MP-2014 (for 10/1/2007 – 10/1/2012, the center of the two most recent 5 year experience periods) was more optimistic than the actual experience, resulting in gains when the base table was advanced five years (and thus MP-2014 applied for five less years) for the new experience period. The impact in ERS was greater than in PFRS.

3) One explanation for the difference between systems is that in ERS there were more withdrawals than expected (generating gains) while in PFRS the rates of retirement at first eligibility were higher than expected (generating losses).

Summary: How did rates fall in spite of a drop in the assumed rate of return?

The contribution rate increase due the assumed rate of return decrease was offset by the combined impact of 1) a salary scale reduction, 2) the ongoing recognition of two strong investment years by the smoothing method (FYs 2011 and 2014), 3) the 5 year advance of the mortality base tables, the improvement in which was overestimated by MP-2014, 4) continued new entrant gains as members are added with less lucrative tier 6 benefits, and 5) the administrative and legislative billing changes.

Summary of Assumptions and Methods

Assumption or Method	Current	Recommendation
Inflation/COLA	2.7 % / 1.4%	**2.5 % / 1.3%**
Investment Return	7.5 %	**7.0 %**
ERS Salary Scale	4.8 % average (using FY 2014 data) Indexed by Service	**3.8 %** average (using FY 2015 data) Indexed by Service
PFRS Salary Scale	5.4 % average (using FY 2014 data) Indexed by Service	**4.5 %** average (using FY 2015 data) Indexed by Service
Asset Valuation Method	5 year level smoothing of gains or losses above or below the assumed return applied to all assets and cash flows	5 year level smoothing of gains or losses above or below the assumed return applied to all assets and cash flows **(no change)**
Pensioner Mortality	Gender/Collar specific tables based upon FY 2006-2010 experience with Society Of Actuaries Scale MP-2014 loading for mortality improvement.	Gender/Collar specific tables based upon **FY 2011-2015 experience** with Society Of Actuaries Scale MP-2014 loading for mortality improvement.
Active Member Decrements	Based upon FY 2006-2010 experience	Based upon **FY 2011-2015 experience**

These recommendations, after having been reviewed by the Actuarial Advisory Committee in a meeting on August 6, 2015, are heretofore submitted to the State Comptroller, Thomas P. DiNapoli, pursuant to Section 11 of the Retirement and Social Security law. The Actuary for the New York State Retirement System recommends adopting these new assumptions beginning with the April 1, 2015 valuation. I am a Member of the American Academy of Actuaries and meet the Academy's Qualification Standards to issue this Statement of Actuarial Opinion.

Historic Employer Contribution Average Rate

Average Rate			Average Rate			Average Rate		
Year	**ERS**	**PFRS**	**Year**	**ERS**	**PFRS**	**Year**	**ERS**	**PFRS**
1972	21.9	28.8	1988	9.7	14.8	2004	5.9	5.8
1973	20.3	31.4	1989	3.7	8.5	2005	12.9	17.6
1974	21.3	32.4	1990	3.6	8.3	2006	11.3	16.3
1975	20.4	32.9	1991	0.3	7.8	2007	10.7	17.0
1976	19.7	32.3	1992	0.4	11.5	2008	9.6	16.6
1977	19.6	33.3	1993	0.6	14.0	2009	8.5	15.8
1978	19.8	34.9	1994	0.7	11.3	2010	7.4	15.1
1979	18.8	35.1	1995	0.7	13.9	2011	11.9	18.2
1980	18.1	34.2	1996	2.2	13.0	2012	16.3	21.6
1981	17.0	33.1	1997	3.7	9.8	2013	18.9	25.8
1982	15.5	29.6	1998	1.7	7.0	2014	20.9	28.9
1983	15.1	28.7	1999	1.3	2.4	2015	20.1	27.6
1984	14.4	27.3	2000	0.9	1.9	2016	18.2	24.7
1985	14.2	26.5	2001	0.9	1.6	2017	15.5	24.3
1986	10.4	19.8	2002	1.2	1.6			
1987	9.4	13.3	2003	1.5	1.4			

Employer Contribution Average Rate Trend
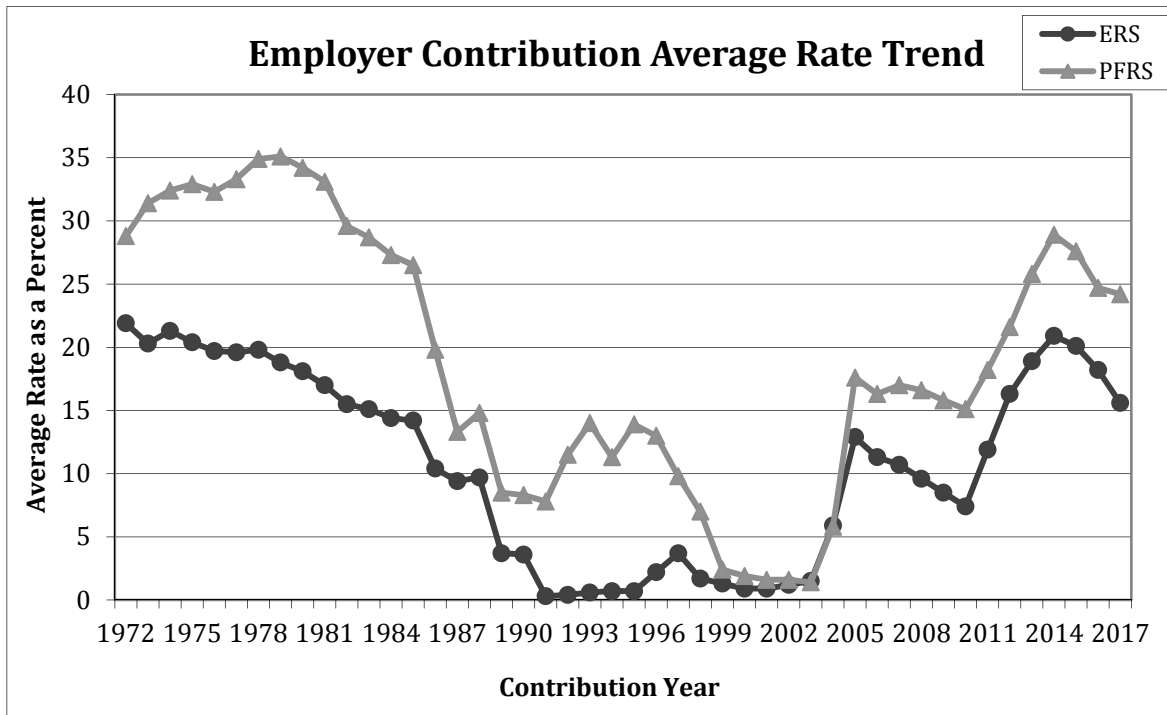
Appendices

Appendix A: A History

FY	Contributions [C]		Benefits [B]	Investments [CRF]	(C-B)/CRF	31-Mar S&P 500		Assumed CRF Return	Average Employer Contribution Rate (%)	
	Employer	Employee							ERS	PFRS
	<---------------- (in millions) ---------------->									
1970	299.2	75.0	158.2	3,532.6	6.1%	89.63	NYSLRS has	4.87%	18.9	22.2
1971	346.0	77.4	194.3	3,888.2	5.9%	100.31	large positive	4.87%	19.8	23.9
1972	490.8	80.4	243.2	4,389.5	7.5%	107.20	net cash flow	4.87%	21.9	28.8
1973	553.0	73.0	287.9	5,167.8	6.5%	111.52		4.87%	20.3	31.4
1974	664.5	61.6	334.6	5,393.0	7.3%	93.98		4.87%	21.3	32.4
1975	749.3	52.9	373.4	5,915.3	7.2%	83.36		5.50%	20.4	32.9
1976	872.2	48.0	431.0	7,080.7	6.9%	102.77		5.50%	19.7	32.3
1977	981.3	41.7	461.3	7,852.0	7.2%	98.42		5.50%	19.6	33.3
1978	1,001.4	71.7	516.8	8,812.5	6.3%	89.21		5.50%	19.8	34.9
1979	1,020.6	61.2	568.8	10,326.7	5.0%	101.59		5.50%	18.8	35.1
1980	1,296.7	34.5	631.4	11,725.9	6.0%	102.09	Asset allocation	5.50%	18.1	34.2
1981	1,296.0	47.8	695.5	14,194.6	4.6%	136.00	shifting to	5.50%	17.0	33.1
1982	1,363.9	61.5	755.8	15,088.5	4.4%	111.96	more equities,	7.50%	15.5	29.6
1983	1,481.3	84.0	840.3	18,626.5	3.9%	152.96		7.50%	15.1	28.7
1984	1,496.1	97.5	940.5	20,618.3	3.2%	159.18	Inflation	7.50%	14.4	27.3
1985	1,610.5	116.0	1,063.4	24,062.3	2.8%	180.66	drops	7.50%	14.2	26.5
1986	1,277.0	132.3	1,157.0	29,926.1	0.8%	238.90	significantly	8.00%	10.4	19.8
1987	1,174.0	151.2	1,275.8	35,621.8	0.1%	291.70		8.00%	9.4	13.3
1988	1,321.3	188.5	1,381.9	35,812.5	0.4%	258.89		8.00%	9.7	14.8
1989	759.4	194.7	1,624.7	40,280.6	-1.7%	294.87		8.75%	3.7	8.5
1990	412.2	229.9	1,670.4	45,189.3	-2.3%	339.94		8.75%	3.6	8.3
1991	-72.4	255.3	1,834.2	48,945.5	-3.4%	375.22		8.75%	0.3	7.8
1992	356.8	287.0	2,067.7	51,925.8	-2.7%	403.69	Oil is	8.75%	0.4	11.5
1993	369.8	284.1	2,267.9	56,428.9	-2.9%	451.67	inexpensive,	8.75%	0.6	14.0
1994	530.1	307.5	2,393.7	58,416.8	-2.7%	445.77		8.75%	0.7	11.3
1995	315.1	334.0	2,527.9	63,406.6	-3.0%	500.71	Gov't a lower	8.75%	0.7	13.9
1996	776.9	341.9	2,877.9	74,827.9	-2.4%	645.50	% of GDP	8.75%	2.2	13.0
1997	903.5	348.2	3,122.0	82,333.8	-2.3%	757.12		8.75%	3.7	9.8
1998	462.6	369.4	3,305.0	104,921.8	-2.4%	1,101.75		8.50%	1.7	7.0
1999	291.7	399.8	3,482.0	111,008.7	-2.5%	1,286.37		8.50%	1.3	2.4
2000	164.5	422.7	3,720.2	127,138.9	-2.5%	1,498.58		8.50%	0.9	1.9
2001	214.8	319.1	4,181.0	112,432.9	-3.2%	1,160.33	Enron & 9/11	8.00%	0.9	1.6
2002	263.8	210.2	4,488.3	111,168.5	-3.6%	1,147.39	Housing	8.00%	1.2	1.6
2003	651.9	219.2	4,984.6	95,598.3	-4.3%	848.18	Bubble	8.00%	1.5	1.4
2004	1,286.5	221.9	5,347.5	119,245.0	-3.2%	1,126.21		8.00%	5.9	5.8
2005	2,964.8	227.3	5,674.7	126,083.5	-2.0%	1,180.59		8.00%	12.9	17.6
2006	2,782.2	241.2	6,028.9	140,453.3	-2.1%	1,294.87		8.00%	11.3	16.3
2007	2,718.6	250.2	6,383.4	154,575.5	-2.2%	1,420.86		8.00%	10.7	17.0
2008	2,648.4	265.7	6,835.6	153,877.7	-2.5%	1,322.70	Housing decline	8.00%	9.6	16.6
2009	2,456.2	273.3	7,212.1	108,960.7	-4.1%	797.87	consequences	8.00%	8.5	15.8
2010	2,344.2	284.3	7,718.9	132,500.2	-3.8%	1,169.43	Rebound	8.00%	7.4	15.1
2011	4,164.6	286.2	8,520.2	147,237.0	-2.8%	1,325.83	and	7.50%	11.9	18.2
2012	4,585.2	273.2	8,937.8	150,658.9	-2.7%	1,408.47	Fed support	7.50%	16.3	21.6
2013	5,336.0	269.1	9,521.5	160,660.8	-2.4%	1,569.19		7.50%	18.9	25.8
2014	6,064.1	281.4	9,977.5	176,835.1	-2.1%	1,872.34		7.50%	20.9	28.9
2015	5,797.4	284.8	10,513.7	184,502.0	-2.4%	2,067.63		7.50%	20.1	27.6

Appendix B: Assumption Details

TABLE 1 Employees Retirement System **Male Clerk Service** Effective 4/1/2015
(For Valuation Purposes Only)

Age	q_x	MP-2014 Factor	2015 Val Qx	Age	q_x	MP-2014 Factor	2015 Val Qx
0	0.000361	0.916441	0.000331	55	0.005237	0.961624	0.005036
1	0.000361	0.916441	0.000331	56	0.005652	0.968998	0.005477
2	0.000361	0.916441	0.000331	57	0.006043	0.974492	0.005889
3	0.000361	0.916441	0.000331	58	0.006408	0.978011	0.006267
4	0.000361	0.916441	0.000331	59	0.006746	0.979884	0.006610
5	0.000361	0.916441	0.000331	60	0.007062	0.980033	0.006921
6	0.000361	0.916441	0.000331	61	0.007367	0.978973	0.007212
7	0.000361	0.916441	0.000331	62	0.007680	0.976831	0.007502
8	0.000361	0.916441	0.000331	63	0.008028	0.973586	0.007816
9	0.000361	0.916441	0.000331	64	0.008445	0.969490	0.008187
10	0.000361	0.916441	0.000331	65	0.008972	0.964965	0.008658
11	0.000361	0.916441	0.000331	66	0.009646	0.960017	0.009260
12	0.000361	0.916441	0.000331	67	0.010505	0.955159	0.010034
13	0.000361	0.916441	0.000331	68	0.011579	0.950608	0.011007
14	0.000361	0.916441	0.000331	69	0.012891	0.946481	0.012201
15	0.000361	0.916441	0.000331	70	0.014455	0.942967	0.013631
16	0.000361	0.916441	0.000331	71	0.016281	0.939989	0.015304
17	0.000361	0.916441	0.000331	72	0.018373	0.937641	0.017227
18	0.000361	0.916441	0.000331	73	0.020737	0.935726	0.019404
19	0.000361	0.916441	0.000331	74	0.023384	0.934220	0.021846
20	0.000361	0.916441	0.000331	75	0.026332	0.932978	0.024567
21	0.000361	0.921664	0.000333	76	0.029615	0.932024	0.027602
22	0.000361	0.926407	0.000334	77	0.033279	0.931452	0.030998
23	0.000361	0.930881	0.000336	78	0.037388	0.930903	0.034805
24	0.000361	0.934605	0.000337	79	0.042022	0.930737	0.039111
25	0.000361	0.938002	0.000339	80	0.047272	0.930760	0.043999
26	0.000361	0.941359	0.000340	81	0.053236	0.931023	0.049564
27	0.000361	0.946024	0.000342	82	0.060012	0.931381	0.055894
28	0.000361	0.951695	0.000344	83	0.067698	0.932001	0.063095
29	0.000361	0.957414	0.000346	84	0.076384	0.932693	0.071243
30	0.000361	0.961866	0.000347	85	0.086154	0.933505	0.080425
31	0.000366	0.964939	0.000353	86	0.097074	0.934413	0.090707
32	0.000387	0.966600	0.000374	87	0.109196	0.935297	0.102131
33	0.000424	0.967310	0.000410	88	0.122560	0.936278	0.114750
34	0.000475	0.969856	0.000461	89	0.137196	0.937451	0.128614
35	0.000532	0.969832	0.000516	90	0.153124	0.938649	0.143730
36	0.000585	0.967484	0.000566	91	0.170361	0.940111	0.160158
37	0.000627	0.962991	0.000604	92	0.188920	0.941912	0.177946
38	0.000655	0.956909	0.000627	93	0.208811	0.944052	0.197128
39	0.000674	0.949644	0.000640	94	0.230044	0.946460	0.217727
40	0.000693	0.942391	0.000653	95	0.252625	0.949137	0.239776
41	0.000722	0.937593	0.000677	96	0.275794	0.951747	0.262486
42	0.000766	0.933216	0.000715	97	0.299710	0.954290	0.286010
43	0.000827	0.929424	0.000769	98	0.323626	0.956642	0.309594
44	0.000900	0.926594	0.000834	99	0.347542	0.959242	0.333377
45	0.000981	0.924600	0.000907	100	0.371458	0.961700	0.357231
46	0.001068	0.923676	0.000986	101	0.396869	0.964259	0.382685
47	0.001159	0.923866	0.001071	102	0.424521	0.966775	0.410416
48	0.001255	0.925029	0.001161	103	0.455911	0.969246	0.441890
49	0.001353	0.926978	0.001254	104	0.492533	0.971892	0.478689
50	0.001447	0.929881	0.001346	105	0.535880	0.974446	0.522186
51	0.002205	0.933171	0.002058	106	0.588944	0.976831	0.575299
52	0.002963	0.936972	0.002776	107	0.654713	0.979492	0.641286
53	0.003721	0.944532	0.003515	108	0.739166	0.982058	0.725904
54	0.004479	0.953246	0.004270	109	0.850525	0.984629	0.837452
				110	1.000000	na	1.000000

APPENDICES

TABLE 2 Employees Retirement System **Female Clerk Service** Effective 4/1/2015
(For Valuation Purposes Only)

Age	qₓ	MP-2014 Factor	2015 Val Qx	Age	qₓ	MP-2014 Factor	2015 Val Qx
0	0.000361	0.918069	0.000331	55	0.003786	0.986064	0.003733
1	0.000361	0.918069	0.000331	56	0.003938	0.984233	0.003876
2	0.000361	0.918069	0.000331	57	0.004107	0.980528	0.004027
3	0.000361	0.918069	0.000331	58	0.004302	0.975355	0.004196
4	0.000361	0.918069	0.000331	59	0.004529	0.969171	0.004389
5	0.000361	0.918069	0.000331	60	0.004802	0.962721	0.004623
6	0.000361	0.918069	0.000331	61	0.005131	0.956349	0.004907
7	0.000361	0.918069	0.000331	62	0.005526	0.950729	0.005254
8	0.000361	0.918069	0.000331	63	0.005993	0.946047	0.005670
9	0.000361	0.918069	0.000331	64	0.006535	0.942102	0.006157
10	0.000361	0.918069	0.000331	65	0.007150	0.939054	0.006714
11	0.000361	0.918069	0.000331	66	0.007836	0.936635	0.007339
12	0.000361	0.918069	0.000331	67	0.008596	0.934985	0.008037
13	0.000361	0.918069	0.000331	68	0.009433	0.933671	0.008807
14	0.000361	0.918069	0.000331	69	0.010357	0.933003	0.009663
15	0.000361	0.918069	0.000331	70	0.011379	0.932717	0.010613
16	0.000361	0.918069	0.000331	71	0.012519	0.932908	0.011679
17	0.000361	0.918069	0.000331	72	0.013796	0.933529	0.012879
18	0.000361	0.918069	0.000331	73	0.015237	0.934317	0.014236
19	0.000361	0.918069	0.000331	74	0.016870	0.935345	0.015779
20	0.000361	0.918069	0.000331	75	0.018733	0.936206	0.017538
21	0.000361	0.924745	0.000334	76	0.020869	0.936804	0.019550
22	0.000361	0.931001	0.000336	77	0.023335	0.937379	0.021874
23	0.000361	0.936853	0.000338	78	0.026195	0.937666	0.024562
24	0.000361	0.942057	0.000340	79	0.029526	0.937786	0.027689
25	0.000361	0.947038	0.000342	80	0.033408	0.937762	0.031329
26	0.000361	0.955936	0.000345	81	0.037927	0.937379	0.035552
27	0.000361	0.966885	0.000349	82	0.043172	0.936804	0.040444
28	0.000361	0.978930	0.000353	83	0.049234	0.936206	0.046093
29	0.000361	0.990192	0.000357	84	0.056202	0.935297	0.052566
30	0.000361	0.997938	0.000360	85	0.064165	0.934413	0.059957
31	0.000366	1.002492	0.000367	86	0.073201	0.933529	0.068335
32	0.000387	1.003724	0.000388	87	0.083384	0.932741	0.077776
33	0.000424	1.001898	0.000425	88	0.094774	0.932454	0.088372
34	0.000475	0.997227	0.000474	89	0.107422	0.932741	0.100197
35	0.000532	0.990132	0.000527	90	0.121370	0.933147	0.113256
36	0.000585	0.981317	0.000574	91	0.136651	0.933768	0.127600
37	0.000627	0.971498	0.000609	92	0.153291	0.934676	0.143277
38	0.000655	0.961550	0.000630	93	0.171310	0.935991	0.160345
39	0.000674	0.952082	0.000642	94	0.190724	0.937595	0.178822
40	0.000693	0.943686	0.000654	95	0.211543	0.939536	0.198752
41	0.000722	0.939364	0.000678	96	0.235986	0.942513	0.222420
42	0.000766	0.936587	0.000717	97	0.261216	0.945520	0.246985
43	0.000827	0.935439	0.000774	98	0.286447	0.948510	0.271698
44	0.000900	0.935775	0.000842	99	0.311677	0.951433	0.296540
45	0.000981	0.937283	0.000919	100	0.336908	0.954435	0.321557
46	0.001068	0.940160	0.001004	101	0.363716	0.957443	0.348237
47	0.001159	0.944028	0.001094	102	0.392888	0.960482	0.377362
48	0.001255	0.950417	0.001193	103	0.426004	0.963406	0.410415
49	0.001353	0.958097	0.001296	104	0.464638	0.966555	0.449098
50	0.001447	0.965697	0.001397	105	0.510368	0.969491	0.494797
51	0.001915	0.972821	0.001863	106	0.566349	0.972530	0.550792
52	0.002383	0.978823	0.002333	107	0.635733	0.975527	0.620175
53	0.002850	0.983192	0.002802	108	0.724829	0.978580	0.709303
54	0.003318	0.985642	0.003270	109	0.842309	0.981564	0.826781
				110	1.000000	na	1.000000

TABLE 3 Employees Retirement System **Male Laborer Service** Effective 4/1/2015
(For Valuation Purposes Only)

Age	qx	MP-2014 Factor	2015 Val Qx	Age	qx	MP-2014 Factor	2015 Val Qx
0	0.000361	0.916441	0.000331	55	0.005739	0.961624	0.005519
1	0.000361	0.916441	0.000331	56	0.006214	0.968998	0.006021
2	0.000361	0.916441	0.000331	57	0.006752	0.974492	0.006580
3	0.000361	0.916441	0.000331	58	0.007366	0.978011	0.007204
4	0.000361	0.916441	0.000331	59	0.008069	0.979884	0.007907
5	0.000361	0.916441	0.000331	60	0.008873	0.980033	0.008696
6	0.000361	0.916441	0.000331	61	0.009790	0.978973	0.009584
7	0.000361	0.916441	0.000331	62	0.010826	0.976831	0.010575
8	0.000361	0.916441	0.000331	63	0.011978	0.973586	0.011662
9	0.000361	0.916441	0.000331	64	0.013236	0.969490	0.012832
10	0.000361	0.916441	0.000331	65	0.014594	0.964965	0.014083
11	0.000361	0.916441	0.000331	66	0.016048	0.960017	0.015406
12	0.000361	0.916441	0.000331	67	0.017605	0.955159	0.016816
13	0.000361	0.916441	0.000331	68	0.019276	0.950608	0.018324
14	0.000361	0.916441	0.000331	69	0.021083	0.946481	0.019955
15	0.000361	0.916441	0.000331	70	0.023053	0.942967	0.021738
16	0.000361	0.916441	0.000331	71	0.025217	0.939989	0.023704
17	0.000361	0.916441	0.000331	72	0.027611	0.937641	0.025889
18	0.000361	0.916441	0.000331	73	0.030274	0.935726	0.028328
19	0.000361	0.916441	0.000331	74	0.033254	0.934220	0.031067
20	0.000361	0.916441	0.000331	75	0.036605	0.932978	0.034152
21	0.000361	0.921664	0.000333	76	0.040392	0.932024	0.037646
22	0.000361	0.926407	0.000334	77	0.044689	0.931452	0.041626
23	0.000361	0.930881	0.000336	78	0.049582	0.930903	0.046156
24	0.000361	0.934605	0.000337	79	0.055162	0.930737	0.051341
25	0.000361	0.938002	0.000339	80	0.061527	0.930760	0.057267
26	0.000361	0.941359	0.000340	81	0.068771	0.931023	0.064027
27	0.000361	0.946024	0.000342	82	0.076982	0.931381	0.071700
28	0.000361	0.951695	0.000344	83	0.086239	0.932001	0.080375
29	0.000361	0.957414	0.000346	84	0.096608	0.932693	0.090106
30	0.000361	0.961866	0.000347	85	0.108140	0.933505	0.100949
31	0.000366	0.964939	0.000353	86	0.120873	0.934413	0.112945
32	0.000387	0.966600	0.000374	87	0.134830	0.935297	0.126106
33	0.000424	0.967310	0.000410	88	0.150030	0.936278	0.140470
34	0.000475	0.969856	0.000461	89	0.166487	0.937451	0.156073
35	0.000532	0.969832	0.000516	90	0.184214	0.938649	0.172912
36	0.000585	0.967484	0.000566	91	0.203225	0.940111	0.191054
37	0.000627	0.962991	0.000604	92	0.223530	0.941912	0.210546
38	0.000655	0.956909	0.000627	93	0.245138	0.944052	0.231423
39	0.000674	0.949644	0.000640	94	0.268055	0.946460	0.253703
40	0.000693	0.942391	0.000653	95	0.292284	0.949137	0.277418
41	0.000722	0.937593	0.000677	96	0.314223	0.951747	0.299061
42	0.000766	0.933216	0.000715	97	0.336870	0.954290	0.321472
43	0.000827	0.929424	0.000769	98	0.359517	0.956642	0.343929
44	0.000900	0.926594	0.000834	99	0.382164	0.959242	0.366588
45	0.000981	0.924600	0.000907	100	0.404811	0.961700	0.389307
46	0.001068	0.923676	0.000986	101	0.428873	0.964259	0.413545
47	0.001159	0.923866	0.001071	102	0.455058	0.966775	0.439939
48	0.001255	0.925029	0.001161	103	0.484782	0.969246	0.469873
49	0.001353	0.926978	0.001254	104	0.519461	0.971892	0.504860
50	0.001447	0.929881	0.001346	105	0.560508	0.974446	0.546185
51	0.002305	0.933171	0.002151	106	0.610756	0.976831	0.596606
52	0.003164	0.936972	0.002965	107	0.673035	0.979492	0.659232
53	0.004022	0.944532	0.003799	108	0.753007	0.982058	0.739497
54	0.004881	0.953246	0.004653	109	0.858457	0.984629	0.845262
				110	1.000000	na	1.000000

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TABLE 4 Employees Retirement System **Female Laborer Service** Effective 4/1/2015
(For Valuation Purposes Only)

Age	q_x	MP-2014 Factor	2015 Val Qx	Age	q_x	MP-2014 Factor	2015 Val Qx
0	0.000361	0.918069	0.000331	55	0.004008	0.986064	0.003952
1	0.000361	0.918069	0.000331	56	0.004222	0.984233	0.004155
2	0.000361	0.918069	0.000331	57	0.004463	0.980528	0.004376
3	0.000361	0.918069	0.000331	58	0.004739	0.975355	0.004622
4	0.000361	0.918069	0.000331	59	0.005060	0.969171	0.004904
5	0.000361	0.918069	0.000331	60	0.005438	0.962721	0.005235
6	0.000361	0.918069	0.000331	61	0.005889	0.956349	0.005632
7	0.000361	0.918069	0.000331	62	0.006428	0.950729	0.006111
8	0.000361	0.918069	0.000331	63	0.007065	0.946047	0.006684
9	0.000361	0.918069	0.000331	64	0.007808	0.942102	0.007356
10	0.000361	0.918069	0.000331	65	0.008658	0.939054	0.008130
11	0.000361	0.918069	0.000331	66	0.009614	0.936635	0.009005
12	0.000361	0.918069	0.000331	67	0.010669	0.934985	0.009975
13	0.000361	0.918069	0.000331	68	0.011822	0.933671	0.011038
14	0.000361	0.918069	0.000331	69	0.013066	0.933003	0.012191
15	0.000361	0.918069	0.000331	70	0.014405	0.932717	0.013436
16	0.000361	0.918069	0.000331	71	0.015845	0.932908	0.014782
17	0.000361	0.918069	0.000331	72	0.017402	0.933529	0.016245
18	0.000361	0.918069	0.000331	73	0.019100	0.934317	0.017845
19	0.000361	0.918069	0.000331	74	0.020977	0.935345	0.019621
20	0.000361	0.918069	0.000331	75	0.023084	0.936206	0.021611
21	0.000361	0.924745	0.000334	76	0.025481	0.936804	0.023871
22	0.000361	0.931001	0.000336	77	0.028234	0.937379	0.026466
23	0.000361	0.936853	0.000338	78	0.031413	0.937666	0.029455
24	0.000361	0.942057	0.000340	79	0.035089	0.937786	0.032906
25	0.000361	0.947038	0.000342	80	0.039334	0.937762	0.036886
26	0.000361	0.955936	0.000345	81	0.044225	0.937379	0.041456
27	0.000361	0.966885	0.000349	82	0.049840	0.936804	0.046690
28	0.000361	0.978930	0.000353	83	0.056267	0.936206	0.052678
29	0.000361	0.990192	0.000357	84	0.063599	0.935297	0.059484
30	0.000361	0.997938	0.000360	85	0.071939	0.934413	0.067221
31	0.000366	1.002492	0.000367	86	0.081401	0.933529	0.075990
32	0.000387	1.003724	0.000388	87	0.092093	0.932741	0.085899
33	0.000424	1.001898	0.000425	88	0.104119	0.932454	0.097086
34	0.000475	0.997227	0.000474	89	0.117567	0.932741	0.109660
35	0.000532	0.990132	0.000527	90	0.132513	0.933147	0.123654
36	0.000585	0.981317	0.000574	91	0.149021	0.933768	0.139151
37	0.000627	0.971498	0.000609	92	0.167140	0.934676	0.156222
38	0.000655	0.961550	0.000630	93	0.186907	0.935991	0.174943
39	0.000674	0.952082	0.000642	94	0.208346	0.937595	0.195344
40	0.000693	0.943686	0.000654	95	0.231473	0.939536	0.217477
41	0.000722	0.939364	0.000678	96	0.255298	0.942513	0.240622
42	0.000766	0.936587	0.000717	97	0.279891	0.945520	0.264643
43	0.000827	0.935439	0.000774	98	0.304483	0.948510	0.288805
44	0.000900	0.935775	0.000842	99	0.329076	0.951433	0.313094
45	0.000981	0.937283	0.000919	100	0.353669	0.954435	0.337554
46	0.001068	0.940160	0.001004	101	0.379799	0.957443	0.363636
47	0.001159	0.944028	0.001094	102	0.408235	0.960482	0.392102
48	0.001255	0.950417	0.001193	103	0.440513	0.963406	0.424393
49	0.001353	0.958097	0.001296	104	0.478170	0.966555	0.462178
50	0.001447	0.965697	0.001397	105	0.522745	0.969491	0.506796
51	0.001959	0.972821	0.001906	106	0.577310	0.972530	0.561452
52	0.002471	0.978823	0.002419	107	0.644941	0.975527	0.629158
53	0.002983	0.983192	0.002933	108	0.731784	0.978580	0.716109
54	0.003495	0.985642	0.003445	109	0.846295	0.981564	0.830693
				110	1.000000	na	1.000000

APPENDICES

TABLE 5 Employees Retirement System **Male Disability** Effective 4/1/2015
(For Valuation Purposes Only)

Age	qₓ	MP-2014 Factor	2015 Val Qx	Age	qₓ	MP-2014 Factor	2015 Val Qx
0	0.003606	0.916441	0.003305	55	0.026515	0.961624	0.025497
1	0.003606	0.916441	0.003305	56	0.027433	0.968998	0.026583
2	0.003606	0.916441	0.003305	57	0.028309	0.974492	0.027587
3	0.003606	0.916441	0.003305	58	0.029057	0.978011	0.028418
4	0.003606	0.916441	0.003305	59	0.029789	0.979884	0.029190
5	0.003606	0.916441	0.003305	60	0.030585	0.980033	0.029974
6	0.003606	0.916441	0.003305	61	0.031412	0.978973	0.030752
7	0.003606	0.916441	0.003305	62	0.032250	0.976831	0.031503
8	0.003606	0.916441	0.003305	63	0.033140	0.973586	0.032265
9	0.003606	0.916441	0.003305	64	0.034069	0.969490	0.033030
10	0.003606	0.916441	0.003305	65	0.035136	0.964965	0.033905
11	0.003606	0.916441	0.003305	66	0.036223	0.960017	0.034775
12	0.003606	0.916441	0.003305	67	0.037546	0.955159	0.035862
13	0.003606	0.916441	0.003305	68	0.038964	0.950608	0.037039
14	0.003606	0.916441	0.003305	69	0.040494	0.946481	0.038327
15	0.003606	0.916441	0.003305	70	0.042030	0.942967	0.039633
16	0.003606	0.916441	0.003305	71	0.043928	0.939989	0.041292
17	0.003606	0.916441	0.003305	72	0.045754	0.937641	0.042901
18	0.003606	0.916441	0.003305	73	0.047919	0.935726	0.044839
19	0.003606	0.916441	0.003305	74	0.050378	0.934220	0.047064
20	0.003606	0.916441	0.003305	75	0.053421	0.932978	0.049841
21	0.003606	0.921664	0.003324	76	0.057163	0.932024	0.053277
22	0.003606	0.926407	0.003341	77	0.061328	0.931452	0.057124
23	0.003606	0.930881	0.003357	78	0.066195	0.930903	0.061621
24	0.003606	0.934605	0.003370	79	0.071919	0.930737	0.066938
25	0.003606	0.938002	0.003382	80	0.078452	0.930760	0.073020
26	0.003606	0.941359	0.003395	81	0.085658	0.931023	0.079750
27	0.003606	0.946024	0.003411	82	0.093959	0.931381	0.087512
28	0.003606	0.951695	0.003432	83	0.103272	0.932001	0.096250
29	0.003606	0.957414	0.003452	84	0.113721	0.932693	0.106067
30	0.003606	0.961866	0.003468	85	0.125426	0.933505	0.117086
31	0.003665	0.964939	0.003536	86	0.138046	0.934413	0.128992
32	0.003871	0.966600	0.003742	87	0.151871	0.935297	0.142045
33	0.004244	0.967310	0.004105	88	0.167208	0.936278	0.156553
34	0.004753	0.969856	0.004610	89	0.184777	0.937451	0.173219
35	0.005321	0.969832	0.005160	90	0.202970	0.938649	0.190518
36	0.005969	0.967484	0.005775	91	0.221125	0.940111	0.207882
37	0.006616	0.962991	0.006371	92	0.239849	0.941912	0.225917
38	0.007264	0.956909	0.006951	93	0.262969	0.944052	0.248256
39	0.007911	0.949644	0.007513	94	0.284496	0.946460	0.269264
40	0.008559	0.942391	0.008066	95	0.307202	0.949137	0.291577
41	0.008866	0.937593	0.008313	96	0.328679	0.951747	0.312819
42	0.009861	0.933216	0.009202	97	0.350848	0.954290	0.334811
43	0.010764	0.929424	0.010004	98	0.373018	0.956642	0.356845
44	0.011581	0.926594	0.010731	99	0.395187	0.959242	0.379080
45	0.013022	0.924600	0.012040	100	0.417357	0.961700	0.401372
46	0.014321	0.923676	0.013228	101	0.440912	0.964259	0.425154
47	0.015747	0.923866	0.014548	102	0.466546	0.966775	0.451045
48	0.017228	0.925029	0.015936	103	0.495643	0.969246	0.480400
49	0.018792	0.926978	0.017420	104	0.529590	0.971892	0.514705
50	0.020051	0.929881	0.018645	105	0.569772	0.974446	0.555212
51	0.021367	0.933171	0.019939	106	0.618961	0.976831	0.604620
52	0.022716	0.936972	0.021284	107	0.679927	0.979492	0.665983
53	0.024076	0.944532	0.022741	108	0.758213	0.982058	0.744609
54	0.025414	0.953246	0.024226	109	0.861440	0.984629	0.848199
				110	1.000000	na	1.000000

TABLE 6 Employees Retirement System **Female Disability** Effective 4/1/2015
(For Valuation Purposes Only)

Age	q_x	MP-2014 Factor	2015 Val Qx	Age	q_x	MP-2014 Factor	2015 Val Qx
0	0.003606	0.918069	0.003311	55	0.028363	0.986064	0.027968
1	0.003606	0.918069	0.003311	56	0.028291	0.984233	0.027845
2	0.003606	0.918069	0.003311	57	0.028087	0.980528	0.027540
3	0.003606	0.918069	0.003311	58	0.027791	0.975355	0.027106
4	0.003606	0.918069	0.003311	59	0.027495	0.969171	0.026647
5	0.003606	0.918069	0.003311	60	0.027139	0.962721	0.026127
6	0.003606	0.918069	0.003311	61	0.026842	0.956349	0.025670
7	0.003606	0.918069	0.003311	62	0.026554	0.950729	0.025246
8	0.003606	0.918069	0.003311	63	0.026397	0.946047	0.024973
9	0.003606	0.918069	0.003311	64	0.026392	0.942102	0.024864
10	0.003606	0.918069	0.003311	65	0.026546	0.939054	0.024928
11	0.003606	0.918069	0.003311	66	0.026892	0.936635	0.025188
12	0.003606	0.918069	0.003311	67	0.027467	0.934985	0.025681
13	0.003606	0.918069	0.003311	68	0.028275	0.933671	0.026400
14	0.003606	0.918069	0.003311	69	0.029331	0.933003	0.027366
15	0.003606	0.918069	0.003311	70	0.030661	0.932717	0.028598
16	0.003606	0.918069	0.003311	71	0.032271	0.932908	0.030106
17	0.003606	0.918069	0.003311	72	0.034197	0.933529	0.031924
18	0.003606	0.918069	0.003311	73	0.036521	0.934317	0.034122
19	0.003606	0.918069	0.003311	74	0.039193	0.935345	0.036659
20	0.003606	0.918069	0.003311	75	0.042207	0.936206	0.039514
21	0.003606	0.924745	0.003335	76	0.045740	0.936804	0.042849
22	0.003606	0.931001	0.003357	77	0.049782	0.937379	0.046665
23	0.003606	0.936853	0.003378	78	0.054205	0.937666	0.050826
24	0.003606	0.942057	0.003397	79	0.059234	0.937786	0.055549
25	0.003606	0.947038	0.003415	80	0.064997	0.937762	0.060952
26	0.003606	0.955936	0.003447	81	0.071189	0.937379	0.066731
27	0.003606	0.966885	0.003487	82	0.078077	0.936804	0.073143
28	0.003606	0.978930	0.003530	83	0.085667	0.936206	0.080202
29	0.003606	0.990192	0.003571	84	0.093981	0.935297	0.087900
30	0.003606	0.997938	0.003599	85	0.103070	0.934413	0.096310
31	0.003665	1.002492	0.003674	86	0.112931	0.933529	0.105424
32	0.003871	1.003724	0.003885	87	0.123817	0.932741	0.115489
33	0.004244	1.001898	0.004252	88	0.135723	0.932454	0.126556
34	0.004753	0.997227	0.004740	89	0.148604	0.932741	0.138609
35	0.005321	0.990132	0.005268	90	0.161679	0.933147	0.150870
36	0.006617	0.981317	0.006493	91	0.175117	0.933768	0.163519
37	0.007913	0.971498	0.007687	92	0.189518	0.934676	0.177138
38	0.009208	0.961550	0.008854	93	0.206125	0.935991	0.192931
39	0.010504	0.952082	0.010001	94	0.220875	0.937595	0.207091
40	0.011800	0.943686	0.011135	95	0.234908	0.939536	0.220705
41	0.013298	0.939364	0.012492	96	0.258626	0.942513	0.243758
42	0.015145	0.936587	0.014185	97	0.283109	0.945520	0.267685
43	0.016504	0.935439	0.015438	98	0.307592	0.948510	0.291754
44	0.017558	0.935775	0.016430	99	0.332075	0.951433	0.315947
45	0.019074	0.937283	0.017878	100	0.356558	0.954435	0.340311
46	0.020523	0.940160	0.019295	101	0.382571	0.957443	0.366290
47	0.022065	0.944028	0.020830	102	0.410879	0.960482	0.394642
48	0.023539	0.950417	0.022372	103	0.443013	0.963406	0.426801
49	0.024794	0.958097	0.023755	104	0.480503	0.966555	0.464433
50	0.025766	0.965697	0.024882	105	0.524878	0.969491	0.508864
51	0.026621	0.972821	0.025897	106	0.579199	0.972530	0.563289
52	0.027327	0.978823	0.026748	107	0.646527	0.975527	0.630705
53	0.027833	0.983192	0.027365	108	0.732983	0.978580	0.717282
54	0.028181	0.985642	0.027776	109	0.846982	0.981564	0.831367
				110	1.000000	na	1.000000

TABLE 7 Police & Fire Retirement System **Service** Effective 4/1/2015
(For Valuation Purposes Only)

Age	qx	MP-2014 Factor	2015 Val Qx	Age	qx	MP-2014 Factor	2015 Val Qx
0	0.000333	0.916441	0.000305	55	0.002866	0.961624	0.002756
1	0.000333	0.916441	0.000305	56	0.003164	0.968998	0.003066
2	0.000333	0.916441	0.000305	57	0.003517	0.974492	0.003427
3	0.000333	0.916441	0.000305	58	0.003922	0.978011	0.003836
4	0.000333	0.916441	0.000305	59	0.004379	0.979884	0.004291
5	0.000333	0.916441	0.000305	60	0.004885	0.980033	0.004787
6	0.000333	0.916441	0.000305	61	0.005438	0.978973	0.005324
7	0.000333	0.916441	0.000305	62	0.006037	0.976831	0.005897
8	0.000333	0.916441	0.000305	63	0.006687	0.973586	0.006510
9	0.000333	0.916441	0.000305	64	0.007400	0.969490	0.007174
10	0.000333	0.916441	0.000305	65	0.008196	0.964965	0.007909
11	0.000333	0.916441	0.000305	66	0.009097	0.960017	0.008733
12	0.000333	0.916441	0.000305	67	0.010127	0.955159	0.009673
13	0.000333	0.916441	0.000305	68	0.011307	0.950608	0.010749
14	0.000333	0.916441	0.000305	69	0.012657	0.946481	0.011980
15	0.000333	0.916441	0.000305	70	0.014199	0.942967	0.013389
16	0.000333	0.916441	0.000305	71	0.015960	0.939989	0.015002
17	0.000333	0.916441	0.000305	72	0.017973	0.937641	0.016852
18	0.000333	0.916441	0.000305	73	0.020284	0.935726	0.018980
19	0.000333	0.916441	0.000305	74	0.022949	0.934220	0.021439
20	0.000333	0.916441	0.000305	75	0.026029	0.932978	0.024284
21	0.000333	0.921664	0.000307	76	0.029590	0.932024	0.027579
22	0.000333	0.926407	0.000308	77	0.033707	0.931452	0.031396
23	0.000333	0.930881	0.000310	78	0.038470	0.930903	0.035812
24	0.000333	0.934605	0.000311	79	0.043980	0.930737	0.040934
25	0.000333	0.938002	0.000312	80	0.050353	0.930760	0.046867
26	0.000333	0.941359	0.000313	81	0.057706	0.931023	0.053726
27	0.000333	0.946024	0.000315	82	0.066155	0.931381	0.061615
28	0.000333	0.951695	0.000317	83	0.075810	0.932001	0.070655
29	0.000333	0.957414	0.000319	84	0.086765	0.932693	0.080925
30	0.000333	0.961866	0.000320	85	0.099106	0.933505	0.092516
31	0.000333	0.964939	0.000321	86	0.112908	0.934413	0.105503
32	0.000342	0.966600	0.000331	87	0.128235	0.935297	0.119938
33	0.000361	0.967310	0.000349	88	0.145140	0.936278	0.135891
34	0.000361	0.969856	0.000350	89	0.163668	0.937451	0.153431
35	0.000361	0.969832	0.000350	90	0.183849	0.938649	0.172570
36	0.000361	0.967484	0.000349	91	0.205708	0.940111	0.193388
37	0.000361	0.962991	0.000348	92	0.229259	0.941912	0.215942
38	0.000361	0.956909	0.000345	93	0.254515	0.944052	0.240275
39	0.000361	0.949644	0.000343	94	0.281484	0.946460	0.266413
40	0.000361	0.942391	0.000340	95	0.310172	0.949137	0.294396
41	0.000361	0.937593	0.000338	96	0.331557	0.951747	0.315559
42	0.000361	0.933216	0.000337	97	0.353632	0.954290	0.337467
43	0.000390	0.929424	0.000362	98	0.375706	0.956642	0.359416
44	0.000428	0.926594	0.000397	99	0.397781	0.959242	0.381568
45	0.000504	0.924600	0.000466	100	0.419855	0.961700	0.403774
46	0.000835	0.923676	0.000771	101	0.443309	0.964259	0.427465
47	0.001165	0.923866	0.001076	102	0.468833	0.966775	0.453256
48	0.001496	0.925029	0.001384	103	0.497806	0.969246	0.482496
49	0.001827	0.926978	0.001694	104	0.531607	0.971892	0.516665
50	0.002158	0.929881	0.002007	105	0.571617	0.974446	0.557010
51	0.002202	0.933171	0.002055	106	0.620595	0.976831	0.606217
52	0.002292	0.936972	0.002148	107	0.681300	0.979492	0.667328
53	0.002431	0.944532	0.002296	108	0.759250	0.982058	0.745628
54	0.002622	0.953246	0.002499	109	0.862034	0.984629	0.848784
				110	1.000000	na	1.000000

APPENDICES

TABLE 8 Police & Fire Retirement System **Disability** Effective 4/1/2015
(For Valuation Purposes Only)

Age	qx	MP-2014 Factor	2015 Val Qx	Age	qx	MP-2014 Factor	2015 Val Qx
0	0.001332	0.916441	0.001221	55	0.004044	0.961624	0.003889
1	0.001332	0.916441	0.001221	56	0.004392	0.968998	0.004256
2	0.001332	0.916441	0.001221	57	0.004784	0.974492	0.004662
3	0.001332	0.916441	0.001221	58	0.005218	0.978011	0.005103
4	0.001332	0.916441	0.001221	59	0.005694	0.979884	0.005579
5	0.001332	0.916441	0.001221	60	0.006214	0.980033	0.006090
6	0.001332	0.916441	0.001221	61	0.006786	0.978973	0.006643
7	0.001332	0.916441	0.001221	62	0.007421	0.976831	0.007249
8	0.001332	0.916441	0.001221	63	0.008135	0.973586	0.007920
9	0.001332	0.916441	0.001221	64	0.008948	0.969490	0.008675
10	0.001332	0.916441	0.001221	65	0.009883	0.964965	0.009537
11	0.001332	0.916441	0.001221	66	0.010973	0.960017	0.010534
12	0.001332	0.916441	0.001221	67	0.012250	0.955159	0.011701
13	0.001332	0.916441	0.001221	68	0.013752	0.950608	0.013073
14	0.001332	0.916441	0.001221	69	0.015515	0.946481	0.014685
15	0.001332	0.916441	0.001221	70	0.017578	0.942967	0.016575
16	0.001332	0.916441	0.001221	71	0.019976	0.939989	0.018777
17	0.001332	0.916441	0.001221	72	0.022744	0.937641	0.021326
18	0.001332	0.916441	0.001221	73	0.025914	0.935726	0.024248
19	0.001332	0.916441	0.001221	74	0.029517	0.934220	0.027575
20	0.001332	0.916441	0.001221	75	0.033581	0.932978	0.031330
21	0.001332	0.921664	0.001228	76	0.038133	0.932024	0.035541
22	0.001332	0.926407	0.001234	77	0.043204	0.931452	0.040242
23	0.001332	0.930881	0.001240	78	0.048825	0.930903	0.045451
24	0.001332	0.934605	0.001245	79	0.055028	0.930737	0.051217
25	0.001332	0.938002	0.001249	80	0.061848	0.930760	0.057566
26	0.001332	0.941359	0.001254	81	0.069317	0.931023	0.064536
27	0.001332	0.946024	0.001260	82	0.077467	0.931381	0.072151
28	0.001332	0.951695	0.001268	83	0.086327	0.932001	0.080457
29	0.001332	0.957414	0.001275	84	0.095925	0.932693	0.089469
30	0.001332	0.961866	0.001281	85	0.106287	0.933505	0.099219
31	0.001332	0.964939	0.001285	86	0.117433	0.934413	0.109731
32	0.001368	0.966600	0.001322	87	0.129382	0.935297	0.121011
33	0.001444	0.967310	0.001397	88	0.142146	0.936278	0.133088
34	0.001444	0.969856	0.001400	89	0.155737	0.937451	0.145996
35	0.001444	0.969832	0.001400	90	0.170162	0.938649	0.159722
36	0.001444	0.967484	0.001397	91	0.185426	0.940111	0.174321
37	0.001444	0.962991	0.001391	92	0.201531	0.941912	0.189824
38	0.001444	0.956909	0.001382	93	0.218480	0.944052	0.206256
39	0.001444	0.949644	0.001371	94	0.236272	0.946460	0.223622
40	0.001444	0.942391	0.001361	95	0.254907	0.949137	0.241942
41	0.001444	0.937593	0.001354	96	0.278005	0.951747	0.264591
42	0.001444	0.933216	0.001348	97	0.301848	0.954290	0.288050
43	0.001560	0.929424	0.001450	98	0.325691	0.956642	0.311570
44	0.001712	0.926594	0.001586	99	0.349534	0.959242	0.335288
45	0.002016	0.924600	0.001864	100	0.373377	0.961700	0.359077
46	0.002239	0.923676	0.002068	101	0.398710	0.964259	0.384460
47	0.002462	0.923866	0.002275	102	0.426279	0.966775	0.412116
48	0.002685	0.925029	0.002484	103	0.457573	0.969246	0.443501
49	0.002907	0.926978	0.002695	104	0.494082	0.971892	0.480195
50	0.003130	0.929881	0.002911	105	0.537297	0.974446	0.523567
51	0.003184	0.933171	0.002971	106	0.590199	0.976831	0.576525
52	0.003308	0.936972	0.003100	107	0.655767	0.979492	0.642318
53	0.003497	0.944532	0.003303	108	0.739963	0.982058	0.726687
54	0.003744	0.953246	0.003569	109	0.850981	0.984629	0.837901
				110	1.000000	na	1.000000

TABLE 9 Employees Retirement System **Male Beneficiaries** Effective 4/1/2015
(For Valuation Purposes Only)

Age	q_x	MP-2014 Factor	2015 Val Qx	Age	q_x	MP-2014 Factor	2015 Val Qx
0	0.000361	0.916441	0.000331	55	0.005237	0.961624	0.005036
1	0.000361	0.916441	0.000331	56	0.005652	0.968998	0.005477
2	0.000361	0.916441	0.000331	57	0.006043	0.974492	0.005889
3	0.000361	0.916441	0.000331	58	0.006408	0.978011	0.006267
4	0.000361	0.916441	0.000331	59	0.006746	0.979884	0.006610
5	0.000361	0.916441	0.000331	60	0.007062	0.980033	0.006921
6	0.000361	0.916441	0.000331	61	0.007367	0.978973	0.007212
7	0.000361	0.916441	0.000331	62	0.007680	0.976831	0.007502
8	0.000361	0.916441	0.000331	63	0.008028	0.973586	0.007816
9	0.000361	0.916441	0.000331	64	0.008445	0.969490	0.008187
10	0.000361	0.916441	0.000331	65	0.008972	0.964965	0.008658
11	0.000361	0.916441	0.000331	66	0.009646	0.960017	0.009260
12	0.000361	0.916441	0.000331	67	0.010505	0.955159	0.010034
13	0.000361	0.916441	0.000331	68	0.011579	0.950608	0.011007
14	0.000361	0.916441	0.000331	69	0.012891	0.946481	0.012201
15	0.000361	0.916441	0.000331	70	0.014455	0.942967	0.013631
16	0.000361	0.916441	0.000331	71	0.016281	0.939989	0.015304
17	0.000361	0.916441	0.000331	72	0.018373	0.937641	0.017227
18	0.000361	0.916441	0.000331	73	0.020737	0.935726	0.019404
19	0.000361	0.916441	0.000331	74	0.023384	0.934220	0.021846
20	0.000361	0.916441	0.000331	75	0.026332	0.932978	0.024567
21	0.000361	0.921664	0.000333	76	0.029615	0.932024	0.027602
22	0.000361	0.926407	0.000334	77	0.033279	0.931452	0.030998
23	0.000361	0.930881	0.000336	78	0.037388	0.930903	0.034805
24	0.000361	0.934605	0.000337	79	0.042022	0.930737	0.039111
25	0.000361	0.938002	0.000339	80	0.047272	0.930760	0.043999
26	0.000361	0.941359	0.000340	81	0.053236	0.931023	0.049564
27	0.000361	0.946024	0.000342	82	0.060012	0.931381	0.055894
28	0.000361	0.951695	0.000344	83	0.067698	0.932001	0.063095
29	0.000361	0.957414	0.000346	84	0.076384	0.932693	0.071243
30	0.000361	0.961866	0.000347	85	0.086154	0.933505	0.080425
31	0.000366	0.964939	0.000353	86	0.097074	0.934413	0.090707
32	0.000387	0.966600	0.000374	87	0.109196	0.935297	0.102131
33	0.000424	0.967310	0.000410	88	0.122560	0.936278	0.114750
34	0.000475	0.969856	0.000461	89	0.137196	0.937451	0.128614
35	0.000532	0.969832	0.000516	90	0.153124	0.938649	0.143730
36	0.000585	0.967484	0.000566	91	0.170361	0.940111	0.160158
37	0.000627	0.962991	0.000604	92	0.188920	0.941912	0.177946
38	0.000655	0.956909	0.000627	93	0.208811	0.944052	0.197128
39	0.000674	0.949644	0.000640	94	0.230044	0.946460	0.217727
40	0.000693	0.942391	0.000653	95	0.252625	0.949137	0.239776
41	0.000722	0.937593	0.000677	96	0.275794	0.951747	0.262486
42	0.000766	0.933216	0.000715	97	0.299710	0.954290	0.286010
43	0.000827	0.929424	0.000769	98	0.323626	0.956642	0.309594
44	0.000900	0.926594	0.000834	99	0.347542	0.959242	0.333377
45	0.000981	0.924600	0.000907	100	0.371458	0.961700	0.357231
46	0.001068	0.923676	0.000986	101	0.396869	0.964259	0.382685
47	0.001159	0.923866	0.001071	102	0.424521	0.966775	0.410416
48	0.001255	0.925029	0.001161	103	0.455911	0.969246	0.441890
49	0.001353	0.926978	0.001254	104	0.492533	0.971892	0.478689
50	0.001447	0.929881	0.001346	105	0.535880	0.974446	0.522186
51	0.002205	0.933171	0.002058	106	0.588944	0.976831	0.575299
52	0.002963	0.936972	0.002776	107	0.654713	0.979492	0.641286
53	0.003721	0.944532	0.003515	108	0.739166	0.982058	0.725904
54	0.004479	0.953246	0.004270	109	0.850525	0.984629	0.837452
				110	1.000000	na	1.000000

The active valuation assumes all beneficiaries will be female.
The impact on active valuation liabilities is not material.

TABLE 10 Employees Retirement System **Female Beneficiaries** Effective 4/1/2015
(For Valuation Purposes Only)

Age	q_x	MP-2014 Factor	2015 Val Qx	Age	q_x	MP-2014 Factor	2015 Val Qx
0	0.000361	0.918069	0.000331	55	0.004844	0.986064	0.004776
1	0.000361	0.918069	0.000331	56	0.005225	0.984233	0.005143
2	0.000361	0.918069	0.000331	57	0.005621	0.980528	0.005512
3	0.000361	0.918069	0.000331	58	0.006031	0.975355	0.005882
4	0.000361	0.918069	0.000331	59	0.006457	0.969171	0.006258
5	0.000361	0.918069	0.000331	60	0.006902	0.962721	0.006645
6	0.000361	0.918069	0.000331	61	0.007372	0.956349	0.007050
7	0.000361	0.918069	0.000331	62	0.007874	0.950729	0.007486
8	0.000361	0.918069	0.000331	63	0.008419	0.946047	0.007965
9	0.000361	0.918069	0.000331	64	0.009015	0.942102	0.008493
10	0.000361	0.918069	0.000331	65	0.009675	0.939054	0.009085
11	0.000361	0.918069	0.000331	66	0.010410	0.936635	0.009750
12	0.000361	0.918069	0.000331	67	0.011235	0.934985	0.010505
13	0.000361	0.918069	0.000331	68	0.012163	0.933671	0.011356
14	0.000361	0.918069	0.000331	69	0.013209	0.933003	0.012324
15	0.000361	0.918069	0.000331	70	0.014394	0.932717	0.013426
16	0.000361	0.918069	0.000331	71	0.015738	0.932908	0.014682
17	0.000361	0.918069	0.000331	72	0.017267	0.933529	0.016119
18	0.000361	0.918069	0.000331	73	0.019008	0.934317	0.017760
19	0.000361	0.918069	0.000331	74	0.020992	0.935345	0.019635
20	0.000361	0.918069	0.000331	75	0.023252	0.936206	0.021769
21	0.000361	0.924745	0.000334	76	0.025829	0.936804	0.024197
22	0.000361	0.931001	0.000336	77	0.028762	0.937379	0.026961
23	0.000361	0.936853	0.000338	78	0.032096	0.937666	0.030095
24	0.000361	0.942057	0.000340	79	0.035879	0.937786	0.033647
25	0.000361	0.947038	0.000342	80	0.040162	0.937762	0.037662
26	0.000361	0.955936	0.000345	81	0.045001	0.937379	0.042183
27	0.000361	0.966885	0.000349	82	0.050451	0.936804	0.047263
28	0.000361	0.978930	0.000353	83	0.056569	0.936206	0.052960
29	0.000361	0.990192	0.000357	84	0.063411	0.935297	0.059308
30	0.000361	0.997938	0.000360	85	0.071030	0.934413	0.066371
31	0.000366	1.002492	0.000367	86	0.079473	0.933529	0.074190
32	0.000387	1.003724	0.000388	87	0.088777	0.932741	0.082806
33	0.000424	1.001898	0.000425	88	0.098967	0.932454	0.092282
34	0.000475	0.997227	0.000474	89	0.110059	0.932741	0.102657
35	0.000532	0.990132	0.000527	90	0.122055	0.933147	0.113895
36	0.000585	0.981317	0.000574	91	0.134949	0.933768	0.126011
37	0.000627	0.971498	0.000609	92	0.148728	0.934676	0.139012
38	0.000655	0.961550	0.000630	93	0.163373	0.935991	0.152916
39	0.000674	0.952082	0.000642	94	0.178862	0.937595	0.167700
40	0.000693	0.943686	0.000654	95	0.195171	0.939536	0.183370
41	0.000722	0.939364	0.000678	96	0.220121	0.942513	0.207467
42	0.000766	0.936587	0.000717	97	0.245875	0.945520	0.232480
43	0.000827	0.935439	0.000774	98	0.271630	0.948510	0.257644
44	0.000900	0.935775	0.000842	99	0.297384	0.951433	0.282941
45	0.000981	0.937283	0.000919	100	0.323139	0.954435	0.308415
46	0.001068	0.940160	0.001004	101	0.350503	0.957443	0.335587
47	0.001159	0.944028	0.001094	102	0.380282	0.960482	0.365254
48	0.001255	0.950417	0.001193	103	0.414085	0.963406	0.398932
49	0.001353	0.958097	0.001296	104	0.453521	0.966555	0.438353
50	0.001447	0.965697	0.001397	105	0.500201	0.969491	0.484940
51	0.002126	0.972821	0.002068	106	0.557344	0.972530	0.542034
52	0.002806	0.978823	0.002747	107	0.628169	0.975527	0.612796
53	0.003485	0.983192	0.003426	108	0.719115	0.978580	0.703711
54	0.004164	0.985642	0.004104	109	0.839034	0.981564	0.823566
				110	1.000000	na	1.000000

Note: Beneficiaries in the active valuation have a 2 year age setback.
A bene age 55 corresponds with a member age 57.

APPENDICES

Table 11 Employees Retirement System **Death and Disability Central Rates of Decrement**
Effective 4/1/2015

Age x	Ord. Dth.	Acc. Dth.	Ord. Dis.	Tiers 1, 2 Acc. Dis	Tiers 3 – 6 Acc. Dis.
15	0.00036	0.00001	0.00049	0.00020	0.00001
16	0.00036	0.00001	0.00049	0.00020	0.00001
17	0.00036	0.00001	0.00049	0.00020	0.00001
18	0.00036	0.00001	0.00049	0.00020	0.00001
19	0.00036	0.00001	0.00049	0.00020	0.00001
20	0.00036	0.00001	0.00049	0.00020	0.00001
21	0.00036	0.00001	0.00049	0.00020	0.00001
22	0.00036	0.00001	0.00049	0.00020	0.00001
23	0.00036	0.00001	0.00049	0.00020	0.00001
24	0.00036	0.00001	0.00049	0.00020	0.00001
25	0.00036	0.00001	0.00049	0.00020	0.00001
26	0.00036	0.00001	0.00049	0.00020	0.00001
27	0.00036	0.00001	0.00049	0.00020	0.00001
28	0.00036	0.00001	0.00049	0.00020	0.00001
29	0.00036	0.00001	0.00049	0.00020	0.00001
30	0.00036	0.00001	0.00049	0.00020	0.00001
31	0.00037	0.00001	0.00049	0.00020	0.00001
32	0.00039	0.00001	0.00055	0.00020	0.00001
33	0.00042	0.00001	0.00065	0.00020	0.00001
34	0.00048	0.00001	0.00077	0.00020	0.00001
35	0.00053	0.00001	0.00087	0.00020	0.00003
36	0.00059	0.00001	0.00095	0.00020	0.00004
37	0.00063	0.00001	0.00099	0.00020	0.00004
38	0.00065	0.00001	0.00101	0.00020	0.00004
39	0.00067	0.00001	0.00103	0.00020	0.00004
40	0.00069	0.00001	0.00108	0.00020	0.00004
41	0.00072	0.00001	0.00119	0.00020	0.00004
42	0.00077	0.00001	0.00137	0.00020	0.00004
43	0.00083	0.00001	0.00160	0.00020	0.00004
44	0.00090	0.00001	0.00185	0.00020	0.00004
45	0.00098	0.00001	0.00212	0.00020	0.00005
46	0.00107	0.00001	0.00240	0.00020	0.00005
47	0.00116	0.00001	0.00270	0.00020	0.00006
48	0.00126	0.00001	0.00299	0.00020	0.00006
49	0.00135	0.00001	0.00326	0.00020	0.00006
50	0.00145	0.00001	0.00348	0.00020	0.00005
51	0.00153	0.00001	0.00364	0.00020	0.00005
52	0.00161	0.00001	0.00374	0.00020	0.00005
53	0.00169	0.00001	0.00404	0.00020	0.00004
54	0.00175	0.00001	0.00437	0.00020	0.00004
55	0.00182	0.00001	0.00472	0.00015	0.00003
56	0.00190	0.00001	0.00509	0.00015	0.00002
57	0.00199	0.00001	0.00550	0.00015	0.00002
58	0.00210	0.00001	0.00594	0.00015	0.00001
59	0.00223	0.00001	0.00642	0.00015	0.00001
60	0.00238	0.00001	0.00693	0.00015	0.00001
61	0.00256	0.00001	0.00748	0.00015	0.00001
62	0.00276	0.00001	0.00808	0.00015	0.00001
63	0.00297	0.00001	0.00873	0.00015	0.00001
64	0.00318	0.00001	0.00943	0.00015	0.00001
65	0.00343	0.00001	0.01018	0.00015	0.00001
66	0.00371	0.00001	0.01100	0.00015	0.00001
67	0.00401	0.00001	0.01188	0.00015	0.00001
68	0.00433	0.00001	0.01283	0.00015	0.00001
69	0.00467	0.00001	0.01385	0.00015	0.00001
70	0.00000	0.00000	0.00000	0.00000	0.00000

APPENDICES

Table 12 Employees Retirement System **Withdrawal Central Rates of Decrement**
Effective 4/1/2015

Age x	N<2	N=2-2.99	N=3-3.99	N=4-4.99	N=5-9.99	N>=10
15	0.25066	0.12991	0.07721	0.06550	0.04365	0.01510
16	0.25066	0.12991	0.07721	0.06550	0.04365	0.01510
17	0.25066	0.12991	0.07721	0.06550	0.04365	0.01510
18	0.25066	0.12991	0.07721	0.06550	0.04365	0.01510
19	0.25066	0.12991	0.07721	0.06550	0.04365	0.01510
20	0.25050	0.12991	0.07721	0.06550	0.04365	0.01510
21	0.24783	0.12991	0.07721	0.06550	0.04365	0.01510
22	0.24260	0.12991	0.07721	0.06550	0.04365	0.01510
23	0.23454	0.13701	0.09013	0.06943	0.04456	0.01510
24	0.22346	0.14193	0.09850	0.07243	0.04510	0.01510
25	0.20978	0.14518	0.10279	0.07437	0.04528	0.01510
26	0.19494	0.14689	0.10441	0.07543	0.04516	0.01510
27	0.18113	0.14683	0.10472	0.07601	0.04481	0.01510
28	0.17029	0.14473	0.10452	0.07643	0.04434	0.01510
29	0.16305	0.14055	0.10406	0.07684	0.04386	0.01523
30	0.15870	0.13472	0.10331	0.07712	0.04347	0.01558
31	0.15602	0.12814	0.10215	0.07702	0.04325	0.01618
32	0.15404	0.12190	0.10052	0.07623	0.04328	0.01700
33	0.15239	0.11689	0.09838	0.07454	0.04355	0.01793
34	0.15102	0.11330	0.09573	0.07197	0.04398	0.01877
35	0.14988	0.11073	0.09256	0.06877	0.04439	0.01934
36	0.14874	0.10849	0.08888	0.06536	0.04454	0.01950
37	0.14723	0.10603	0.08481	0.06223	0.04421	0.01921
38	0.14516	0.10318	0.08058	0.05972	0.04332	0.01856
39	0.14261	0.10012	0.07649	0.05793	0.04200	0.01773
40	0.13991	0.09714	0.07283	0.05674	0.04048	0.01692
41	0.13741	0.09446	0.06981	0.05594	0.03905	0.01630
42	0.13530	0.09211	0.06753	0.05535	0.03790	0.01594
43	0.13363	0.09004	0.06595	0.05488	0.03709	0.01582
44	0.13237	0.08819	0.06494	0.05449	0.03655	0.01583
45	0.13150	0.08652	0.06433	0.05413	0.03614	0.01582
46	0.13108	0.08506	0.06395	0.05375	0.03571	0.01561
47	0.13123	0.08382	0.06365	0.05325	0.03515	0.01515
48	0.13199	0.08279	0.06339	0.05260	0.03443	0.01448
49	0.13328	0.08198	0.06316	0.05180	0.03362	0.01374
50	0.13485	0.08135	0.06301	0.05101	0.03283	0.01308
51	0.13633	0.08089	0.06301	0.05038	0.03219	0.01260
52	0.13733	0.08060	0.06320	0.05010	0.03187	0.01229
53	0.13762	0.08048	0.06362	0.05026	0.03199	0.01211
54	0.13721	0.08056	0.06427	0.05086	0.03253	0.01202
55	0.13641	0.08095	0.06520	0.05181	0.03320	0.01198
56	0.13571	0.08188	0.06645	0.05298	0.03337	0.01196
57	0.13573	0.08364	0.06810	0.05424	0.03247	0.01196
58	0.13702	0.08653	0.07024	0.05553	0.03033	0.01196
59	0.13993	0.09081	0.07293	0.05684	0.02720	0.01196
60	0.14448	0.09655	0.07617	0.05821	0.02363	0.01196
61	0.15016	0.10356	0.07985	0.05962	0.02045	0.01196
62	0.15582	0.11118	0.08365	0.06096	0.01874	0.01196
63	0.15971	0.11118	0.08365	0.06096	0.01874	0.01196
64	0.15971	0.11118	0.08365	0.06096	0.01874	0.01196
65	0.15971	0.11118	0.08365	0.06096	0.01874	0.01196
66	0.15971	0.11118	0.08365	0.06096	0.01874	0.01196
67	0.15971	0.11118	0.08365	0.06096	0.01874	0.01196
68	0.15971	0.11118	0.08365	0.06096	0.01874	0.01196
69	0.15971	0.11118	0.08365	0.06096	0.01874	0.01196
70	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Note: to get Tier 5&6 withdrawal rates for N=5 to 9.99, multiply by * .6. For N=10, multiply by 2.

TABLE 13 Employees Retirement System **Central Rates of Decrement – Age 55 Retirement Table**
Effective 4/1/2015

Tier 1

Age x	Serv <20	Serv 20-29.99	Serv >= 30
55	0.16985	0.34977	0.77499
56	0.09286	0.13929	0.26808
57	0.07541	0.11619	0.23320
58	0.09055	0.12956	0.21587
59	0.10371	0.15469	0.21164
60	0.10331	0.17394	0.21365
61	0.13785	0.21229	0.24184
62	0.19152	0.34528	0.35390
63	0.15155	0.25017	0.23024
64	0.17236	0.29052	0.23115
65	0.22845	0.29262	0.26254
66	0.23898	0.31788	0.26292
67	0.19844	0.28362	0.22238
68	0.15865	0.31095	0.20547
69	0.19512	0.26244	0.18605
70	2.00000	2.00000	2.00000

Tiers 2, 3 & 4

Age x	Serv <20	Serv 20-29.99	*Serv >= 30
55	0.05709	0.09699	0.49644
56	0.03790	0.05833	0.18949
57	0.03798	0.06138	0.19353
58	0.04130	0.06845	0.18667
59	0.04706	0.07568	0.20626
60	0.05402	0.08467	0.21232
61	0.08467	0.18948	0.25166
62	0.14854	0.37678	0.34932
63	0.11136	0.24518	0.26016
64	0.12653	0.24300	0.22955
65	0.16595	0.28931	0.22940
66	0.18398	0.32495	0.26979
67	0.16206	0.27929	0.25803
68	0.15145	0.27447	0.22906
69	0.15375	0.26557	0.24605
70	2.00000	2.00000	2.00000

Tier 5

Age	Serv <20	Serv 20-29.99	Serv >= 30
<62	Tiers 2, 3 & 4 Serv < 20 rate * .8	Tiers 2, 3 & 4 Serv 20-29.99 rate * .8	Tiers 2, 3 & 4 Serv 20-29.99 rate as is
=62	Tiers 2, 3 & 4 Serv < 20 rate + 0.2	Tiers 2, 3 & 4 Serv 20-29.99 rate + 0.1	Tiers 2, 3 & 4 Serv >= 30 rate + 0.8
>62	Tiers 2, 3 & 4 Serv < 20 rate as is	Tiers 2, 3 & 4 Serv 20-29.99 rate as is	Tiers 2, 3 & 4 Serv >= 30 rate

*Service retirement rates for tier 5 unified court peace officers with service >= 30 are the same as those for tiers 2, 3 and 4.

Tier 6

Age	Serv <20	Serv 20-29.99	Serv >= 30
<62	Tiers 2, 3 & 4 Serv < 20 rate * 0.8	Tiers 2, 3 & 4 Serv 20-29 rate * 0.8	Tiers 2, 3 & 4 Serv 20-29.99 rate as is
=62	Tiers 2, 3 & 4 Serv < 20 rate - 0.05	Tiers 2, 3 & 4 Serv 20-29 rate - 0.2	Tiers 2, 3 & 4 Serv 20-29.99 - 0.1
=63	Tiers 2, 3 & 4 Serv < 20 rate + 0.25	Tiers 2, 3 & 4 Serv 20-29 rate + 0.3	Tiers 2, 3 & 4 Serv >= 30 rate + 0.9
>63	Tiers 2, 3 & 4 Serv < 20 rate as is	Tiers 2, 3 & 4 Serv 20-29 rate as is	Tiers 2, 3 & 4 Serv >= 30 rate

Table 14 Employees Retirement System **Central Rates of Decrement – Retirement Table**
Effective 4/1/2015

Service	State Corrections Officers 25 Yr. Plan Tiers 1&2	State Corrections Officers 25 Yr. Plan Tiers 3, 5 &6	County Corrections Officers 25 Yr. Plan
25	0.20915	0.28858	0.26797
26	0.22135	0.20282	0.15582
27	0.22418	0.15548	0.12082
28	0.21834	0.14194	0.09719
29	0.20314	0.14808	0.14414
30	0.18023	0.15703	0.23014
31	0.15638	0.15953	0.22628
32	0.15787	0.15952	0.19910
33	0.18173	0.16334	0.23014
34	0.20559	0.17794	0.32068
35	0.23067	0.20875	0.31707
36	0.27093	0.25848	0.31707
37	0.33205	0.32815	0.31707
38	0.38247	0.32815	0.31707
39	0.39053	0.32815	0.31707
40	0.39053	0.32815	0.31707
41	0.39053	0.32815	0.31707
42	0.39053	0.32815	0.31707
43	0.39053	0.32815	0.31707
44	0.39053	0.32815	0.31707
45	0.39053	0.32815	0.31707
46	0.39053	0.32815	0.31707
47	0.39053	0.32815	0.31707
48	0.39053	0.32815	0.31707
49	0.39053	0.32815	0.31707
50	2.00000	2.00000	2.00000

Table 15 Police & Fire Retirement System **Death and Disability Central Rates of Decrement**
Effective 4/1/2015

Age x	Ord. Dth.	Acc. Dth.	Ord. Dis.	POD. Dis	Acc. Dis.
15	0.00033	0.00008	0.00047	0.00011	0.00042
16	0.00033	0.00008	0.00047	0.00011	0.00042
17	0.00033	0.00008	0.00047	0.00011	0.00042
18	0.00033	0.00008	0.00047	0.00011	0.00042
19	0.00033	0.00008	0.00047	0.00011	0.00042
20	0.00033	0.00008	0.00047	0.00011	0.00042
21	0.00033	0.00008	0.00047	0.00011	0.00042
22	0.00033	0.00008	0.00047	0.00011	0.00042
23	0.00033	0.00008	0.00047	0.00011	0.00042
24	0.00033	0.00008	0.00047	0.00011	0.00042
25	0.00033	0.00008	0.00047	0.00011	0.00042
26	0.00033	0.00008	0.00047	0.00011	0.00042
27	0.00033	0.00008	0.00047	0.00011	0.00042
28	0.00033	0.00008	0.00047	0.00014	0.00042
29	0.00033	0.00008	0.00047	0.00018	0.00042
30	0.00033	0.00008	0.00047	0.00023	0.00042
31	0.00034	0.00008	0.00047	0.00031	0.00056
32	0.00036	0.00008	0.00047	0.00041	0.00073
33	0.00036	0.00008	0.00047	0.00055	0.00091
34	0.00036	0.00008	0.00047	0.00071	0.00110
35	0.00036	0.00008	0.00047	0.00089	0.00130
36	0.00036	0.00008	0.00047	0.00110	0.00151
37	0.00036	0.00008	0.00047	0.00132	0.00171
38	0.00036	0.00008	0.00047	0.00154	0.00191
39	0.00036	0.00008	0.00047	0.00176	0.00210
40	0.00036	0.00008	0.00038	0.00197	0.00227
41	0.00036	0.00008	0.00032	0.00219	0.00245
42	0.00039	0.00008	0.00029	0.00242	0.00265
43	0.00043	0.00008	0.00031	0.00268	0.00287
44	0.00050	0.00008	0.00037	0.00297	0.00313
45	0.00059	0.00008	0.00047	0.00327	0.00339
46	0.00067	0.00008	0.00059	0.00351	0.00363
47	0.00076	0.00008	0.00073	0.00366	0.00381
48	0.00083	0.00008	0.00079	0.00366	0.00392
49	0.00086	0.00008	0.00086	0.00366	0.00397
50	0.00088	0.00008	0.00092	0.00366	0.00396
51	0.00092	0.00006	0.00100	0.00366	0.00392
52	0.00101	0.00006	0.00108	0.00366	0.00388
53	0.00117	0.00006	0.00116	0.00366	0.00385
54	0.00143	0.00006	0.00126	0.00366	0.00382
55	0.00179	0.00006	0.00136	0.00366	0.00379
56	0.00222	0.00006	0.00147	0.00366	0.00377
57	0.00272	0.00006	0.00158	0.00366	0.00376
58	0.00327	0.00006	0.00171	0.00366	0.00376
59	0.00395	0.00006	0.00185	0.00366	0.00376
60	0.00489	0.00006	0.00200	0.00366	0.00376
61	0.00499	0.00006	0.00216	0.00366	0.00376
62	0.00542	0.00006	0.00233	0.00366	0.00376
63	0.00590	0.00006	0.00251	0.00366	0.00376
64	0.00648	0.00006	0.00272	0.00366	0.00376
65	0.00719	0.00006	0.00293	0.00366	0.00376
66	0.00807	0.00006	0.00317	0.00366	0.00376
67	0.00908	0.00006	0.00342	0.00366	0.00376
68	0.01017	0.00006	0.00369	0.00366	0.00376
69	0.01130	0.00006	0.00399	0.00366	0.00376
70	0.00000	0.00000	0.00000	0.00000	0.00000

Table 15 Police & Fire Retirement System
Withdrawal Central Rates of Decrement
Effective 4/1/2015

Service	Withdrawal
0	0.07107
1	0.04974
2	0.03305
3	0.02203
4	0.01557
5	0.01175
6	0.00941
7	0.00792
8	0.00695
9	0.00622
10	0.00550
11	0.00474
12	0.00402
13	0.00345
14	0.00303
15	0.00277
16	0.00254
17	0.00233
18	0.00221
19	0.00221
20	0.00221
21	0.00221
22	0.00221
23	0.00221
24	0.00221
25	0.00221
26	0.00221
27	0.00221
28	0.00221
29	0.00221
30	0.00221
31	0.00221
32	0.00221
33	0.00221
34	0.00221
35	0.00221
36	0.00221
37	0.00221
38	0.00221
39	0.00221
40	0.00221
41	0.00221
42	0.00221
43	0.00221
44	0.00221
45	0.00221
46	0.00221
47	0.00221
48	0.00221
49	0.00221
50	0.00221

TABLE 17 Police & Fire System **Central Rates of Decrement – Age 55 Retirement Table**
Effective 4/1/2015

Tier 1			
Age x	**Serv <20**	**Serv 20-29.99**	**Serv >= 30**
55	0.16985	0.34977	0.77499
56	0.09286	0.13929	0.26808
57	0.07541	0.11619	0.23320
58	0.09055	0.12956	0.21587
59	0.10371	0.15469	0.21164
60	0.10331	0.17394	0.21365
61	0.13785	0.21229	0.24184
62	0.19152	0.34528	0.35390
63	0.15155	0.25017	0.23024
64	0.17236	0.29052	0.23115
65	0.22845	0.29262	0.26254
66	0.23898	0.31788	0.26292
67	0.19844	0.28362	0.22238
68	0.15865	0.31095	0.20547
69	0.19512	0.26244	0.18605
70	2.00000	2.00000	2.00000
Tiers 2, 5 & 6			
Age x	**Serv <20**	**Serv 20-29.99**	***Serv >= 30**
55	0.16985	0.34977	0.34977
56	0.09286	0.13929	0.13929
57	0.07541	0.11619	0.11619
58	0.09055	0.12956	0.12956
59	0.10371	0.15469	0.15469
60	0.10331	0.17394	0.17394
61	0.13785	0.21229	0.21229
62	0.19152	0.34528	0.34528
63	0.15155	0.25017	0.25017
64	0.17236	0.29052	0.29052
65	0.22845	0.29262	0.29262
66	0.23898	0.31788	0.31788
67	0.19844	0.28362	0.28362
68	0.15865	0.31095	0.31095
69	0.19512	0.26244	0.26244
70	2.00000	2.00000	2.00000

Age 55 retirement plans make up less than 1% of all PFRS by salary.

TABLE 18 Police & Fire System **Central Rates of Decrement –Retirement Table**
Effective 4/1/2015

Service	20 Year Plan (no add'l 60th's)	20 Year Plan (add'l 60th's)	20 Year Plan State Police	20 Year Plan Article 14
20	0.25890	0.09282	0.06373	0.02000
21	0.13274	0.04911	0.09922	0.02000
22	0.10086	0.05414	0.05521	0.02000
23	0.10089	0.06129	0.06452	0.02000
24	0.09023	0.07224	0.07687	0.02000
25	0.08010	0.07400	0.08397	0.80000
26	0.08973	0.09091	0.11000	0.50000
27	0.07561	0.09685	0.11695	0.50000
28	0.08008	0.10948	0.14717	0.50000
29	0.06596	0.16112	0.15848	0.50000
30	0.07627	0.17683	0.22222	0.50000
31	0.10508	0.19312	0.24685	0.50000
32	0.13971	0.31972	0.42254	0.50000
33	0.08627	0.26005	0.24658	0.50000
34	0.12919	0.19640	0.24658	0.50000
35	0.14245	0.25214	0.24658	0.50000
36	0.14245	0.25214	0.24658	0.50000
37	0.14245	0.25214	0.24658	0.50000
38	0.14245	0.25214	0.24658	0.50000
39	0.14245	0.25214	0.24658	0.50000
40	0.14245	0.25214	0.24658	0.50000
41	0.14245	0.25214	0.24658	0.50000
42	0.14245	0.25214	0.24658	0.50000
43	0.14245	0.25214	0.24658	0.50000
44	0.14245	0.25214	0.24658	0.50000
45	0.14245	0.25214	0.24658	0.50000
46	0.14245	0.25214	0.24658	0.50000
47	0.14245	0.25214	0.24658	0.50000
48	0.14245	0.25214	0.24658	0.50000
49	0.14245	0.25214	0.24658	0.50000
50	2.00000	2.00000	2.00000	2.00000

TABLE 19 Employees Retirement System
Salary Scales
Effective 4/1/2015

Service	Increase
0	1.0800
1	1.0800
2	1.0700
3	1.0600
4	1.0500
5	1.0450
6	1.0420
7	1.0410
8	1.0400
9	1.0390
10	1.0380
11	1.0370
12	1.0360
13	1.0350
14	1.0340
15	1.0330
16	1.0320
17	1.0310
18	1.0300
19	1.0300
20	1.0300
21	1.0300
22	1.0300
23	1.0300
24	1.0300
25	1.0300
26	1.0300
27	1.0300
28	1.0300
29	1.0300
30	1.0300
31	1.0300
32	1.0300
33	1.0300
34	1.0300
35	1.0300
36	1.0300
37	1.0300
38	1.0300
39	1.0300
40	1.0300
41	1.0300
42	1.0300
43	1.0300
44	1.0300
45	1.0300
46	1.0300
47	1.0300
48	1.0300
49	1.0300
50	1.0300
51	1.0300
52	1.0300
53	1.0300
54	1.0300
55	1.0300

TABLE 20 Police & Fire Retirement System
Salary Scales
Effective 4/1/2015

Service	Increase
0	1.2700
1	1.2700
2	1.1350
3	1.1150
4	1.0950
5	1.0750
6	1.0530
7	1.0440
8	1.0430
9	1.0420
10	1.0410
11	1.0400
12	1.0390
13	1.0380
14	1.0370
15	1.0360
16	1.0350
17	1.0340
18	1.0330
19	1.0330
20	1.0330
21	1.0330
22	1.0330
23	1.0330
24	1.0330
25	1.0330
26	1.0330
27	1.0330
28	1.0330
29	1.0330
30	1.0330
31	1.0330
32	1.0330
33	1.0330
34	1.0330
35	1.0330
36	1.0330
37	1.0330
38	1.0330
39	1.0330
40	1.0330
41	1.0330
42	1.0330
43	1.0330
44	1.0330
45	1.0330
46	1.0330
47	1.0330
48	1.0330
49	1.0330
50	1.0330
51	1.0330
52	1.0330
53	1.0330
54	1.0330
55	1.0330

Appendix C: Assumed Rate of Return Development

CIO

Periodically analyzes the investment landscape
to determine the optimal asset allocation:
- guided by internal staff, external consultants,
  and the Investment Advisory Committee
- mindful of projected benefit payouts
  and the sensitivity of employer
  contributions to investment performance.

F E E D B A C K

S T I M U L U S

Following **Comptroller** approval of the
recommended rate of return
assumption, the **CIO** is so informed.
After each annual actuarial valuation the
Actuary provides the projected benefit
payouts for retirees and beneficiaries.

Following **Comptroller** approval
of the asset allocation policy,
the **Actuary** is informed of:
- the asset allocation policy
- the asset class capital market
  assumptions and correlations.

ACTUARY

Using stochastic modeling, determines/confirms
the expected rate of return of the asset allocation
policy given the asset class capital market
assumptions and correlations and recommends a
rate of return assumption:
- guided by internal staff, an external consultant,
  and the Actuarial Advisory Committee
- mindful of the impact on employer contributions
  and the objective of smooth contribution rates.