Classic Values, Innovative Advice

State Teachers Retirement System of Ohio

Actuarial Valuation Report as of July 1, 2018

Produced by Cheiron

October 2018

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October 10, 2018

Board of Trustees
State Teachers Retirement System of Ohio
275 East Broad Street
Columbus, Ohio 43215

Dear Members of the Board:

This report presents the July 1, 2018 Actuarial Valuation of the State Teachers Retirement System of Ohio ("STRS"). In preparing our report, we relied on information, some oral and some written, supplied by the STRS. This information includes, but is not limited to, the plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23.

The actuarial assumptions and methods used in this valuation are the same as those recommended by the prior actuary. The actuarial assumptions were adopted by the Board based on recommendations from the prior actuary from an experience study covering plan experience for the period July 1, 2011 through June 30, 2016. Cheiron has reviewed this experience study dated March 3, 2017. While we consider these assumptions to be generally reasonable, we have not yet performed our own actuarial experience study.

Included in the report are the follow supporting schedules prepared by Cheiron to be included in the Financial, Actuarial and Statistical sections of the STRS Ohio *Comprehensive Annual Financial Report*:

- Financial/Required Supplementary Information
  - Schedule of Changes in Employers' Net Pension Liability
  - Schedule of Employers' Net Pension Liability
  - Schedule of Employers' Contributions – Pension
  - Notes to Required Supplementary Information - Pension
  - Sensitivity of the Net Pension Liability to the Discount Rate Assumption

- Actuarial
  - Schedule of Valuation Data – Active Members
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- Statistical
  - Actuarial Funded Ratio & Funding Period
  - Selected Funding Information – Defined Benefit Plan
  - Number of Benefit Recipients by Type
  - Summary of Active Membership Data

- Benefit Payments by Type

Future actuarial measurements may differ significantly from the current measurements due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; and, changes in plan provisions or applicable law.

To the best of our knowledge, this report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This report was prepared for STRS for the purposes described herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other user.

Gene Kalwarski, FSA, FCA, MAAA, EA
Principal Consulting Actuary

Janet Cranna, FSA, FCA, MAAA, EA
Principal Consulting Actuary

SECTION I – BOARD SUMMARY

The primary purpose of the actuarial valuation and this report is to:

- Measure and disclose as of the valuation date, the financial condition of the Plan,
- Indicate trends, both historical and prospective, in the financial progress of the Plan,
- Disclose details on STRS and Member contributions,
- Provide information to be included in the Comprehensive Annual Financial Report, and
- Provide information required for STRS's financial reporting under GASB 67 and the collective employers' disclosures under GASB 68.

In the balance of this Board Summary, we present (A) the key findings of this valuation including a summary of all key financial results, (B) a review of the historical trends, and (C) the projected financial outlook for STRS.

Key Findings of this Valuation

The key results of the July 1, 2018 Actuarial Valuation is as follows:

- The unfunded actuarial liability (UAL) decreased from $23.9 billion as of July 1, 2017 to $23.8 billion as of July 1, 2018.

- The fixed State contribution rate of 14.0% of payroll for members in the Defined Benefit Plan and Combined Plan and 4.47% of payroll for participants in the Defined Contribution Plan and Alternative Retirement Plan, along with member contributions of 14.0% for the Defined Benefit Plan and 2.0% of contributions for the Combined Plan, will cover the cost of ongoing benefit accruals (i.e., Normal Cost) and amortize the UAL over 17.8 years.

- The STRS funding ratio, the ratio of actuarial asset value over actuarial liabilities increased from 75.1% as of July 1, 2017 to 75.5% as of July 1, 2018.

- There was a net actuarial experience loss of $368 million.
    - During the year ended June 30, 2018, the Plan's assets earned 9.51% (net of investment and administrative expenses) on a market value basis, but due to smoothing of prior investment gains and losses, the return on the actuarial asset value was 7.08% (as compared to 7.45% assumed for the period ending June 30, 2018). This resulted in a slight actuarial loss on investments of $254 million.

    - On the liability side, the plan experienced an actuarial experience loss of $114 million.

- The transition to a new actuary resulted in a gain of $236 million.

SECTION I – BOARD SUMMARY

Following is Table I-1, which summarizes all the key results of the valuation with respect to the System's membership, assets and liabilities, and contributions. The results are presented and compared for both the current and prior plan year.

Table I-1
State Teachers Retirements System of Ohio
Summary of Principal Results[1]

	July 1, 2018			July 1, 2017	%
	Defined Benefit	Combined	Total	Total	change
Counts					
Active Members					
(i) Defined Benefit	163,938	6,389	170,327	168,132	1.31%
(ii) Defined Contribution	9,682	-	9,682	9,330	3.77%
Reemployed Retirees	22,038	-	22,038	25,009	(11.88%)
Inactive Members					
(i) Eligible for Allowances	17,871	545	18,416	18,403	0.07%
(ii) Eligible for Refunds Only	136,914	1,161	138,075	139,533	(1.04%)
Retirees and Beneficiaries	157,040	382	157,422	158,039	(0.39%)
Total	**507,483**	**8,477**	**515,960**	**518,446**	(0.48%)
Total Payroll					
(i) Defined Benefit Plan Members	$ 10,414,510,184	$ 361,016,055	$ 10,775,526,239	$ 10,459,706,000	3.02%
(ii) Defined Contribution Plan Members	412,658,177	-	412,658,177	392,619,000	5.10%
(iii) Alternative Retirement Plan Members	735,503,706	-	735,503,706	704,822,000	4.35%
Total	$ 11,562,672,067	$ 361,016,055	$ 11,923,688,122	$ 11,557,147,000	3.17%
Annual Allowances	$ 6,946,657,121	$ 2,764,776	$ 6,949,421,897	$ 6,955,309,000	(0.08%)
Assets and Liabilities					
Actuarial Liability (AL)[2]	$ 96,637,754,733	$ 266,301,819	$ 96,904,056,552	$ 96,126,440,462	0.81%
Actuarial Value of Assets (AVA)			73,115,358,320	72,216,212,329	1.25%
Unfunded Actuarial Liability (UAL)			$ 23,788,698,232	$ 23,910,228,133	(0.51%)
Funded Ratio (AVA basis)			75.5%	75.1%	0.43%
Market Value of Assets (MVA)			$ 74,916,301,830	$ 72,371,226,119	3.52%
Funded Ratio (MVA basis)			77.3%	75.3%	
Funding Period			17.8 years	18.4 years	(3.65%)
Contribution Rates			**Fiscal Year 2018**	**Fiscal Year 2017**	
Normal Cost	10.91%	4.00%	10.67%	10.45%	2.14%
Member Contribution Rate	14.00%	2.00%	13.58%	13.61%	(0.20%)
Allocation of Employer Contribution Rate					
Employer Normal Cost	(3.09%)	2.00%	(2.91%)	(3.16%)	(7.94%)
Unfunded Actuarial Accrued Liability	17.09%	12.00%	16.91%	17.16%	(1.46%)
Total Employer Pension Contribution	14.00%	14.00%	14.00%	14.00%	0.00%
Health Care	0.00%	0.00%	0.00%	0.00%	0.00%
Total Employer Contribution	14.00%	14.00%	14.00%	14.00%	0.00%

[1]July 1, 2017 results are from the prior actuary's report.

[2]Defined Benefit Actuarial Liability (AL) includes Defined Contribution Account Balances and prior Defined Contribution participants who have converted their account to an annuity.

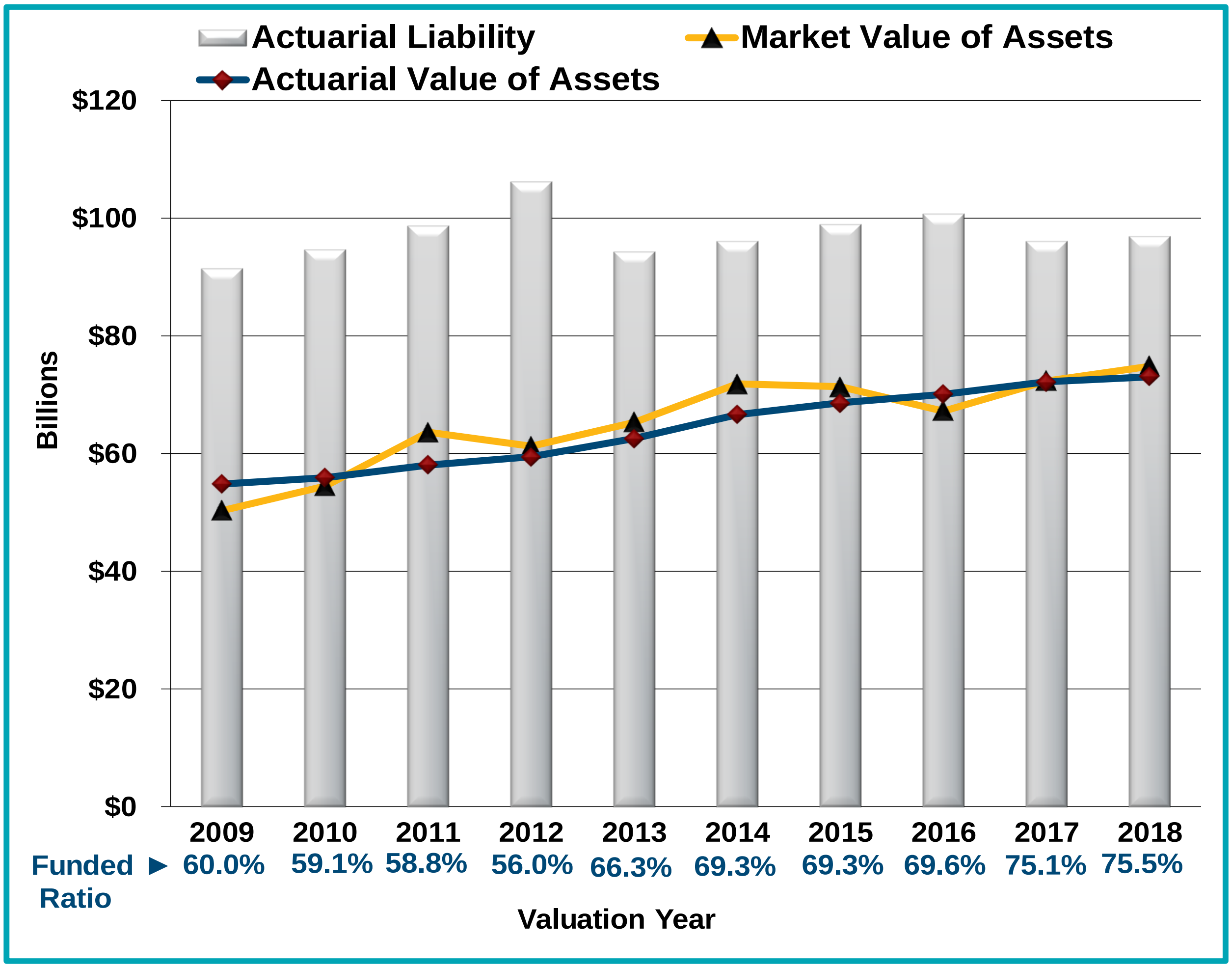
Historical Trends

It is important to take a step back from the latest results and view them in the context of the Plan's recent history. On the next few pages, we present a series of charts which display key results in the valuations over the last few years.

Assets and Liabilities

The grey bars represent the Actuarial Liability (AL). The gold line is the Market Value of Assets (MVA), and the blue line is the Actuarial Value of Assets (AVA). The Plan's funded ratio (ratio of AVA to AL) is shown below the x-axis where we show the valuation year.

The Plan's funded ratio has been steadily increasing since 2013.

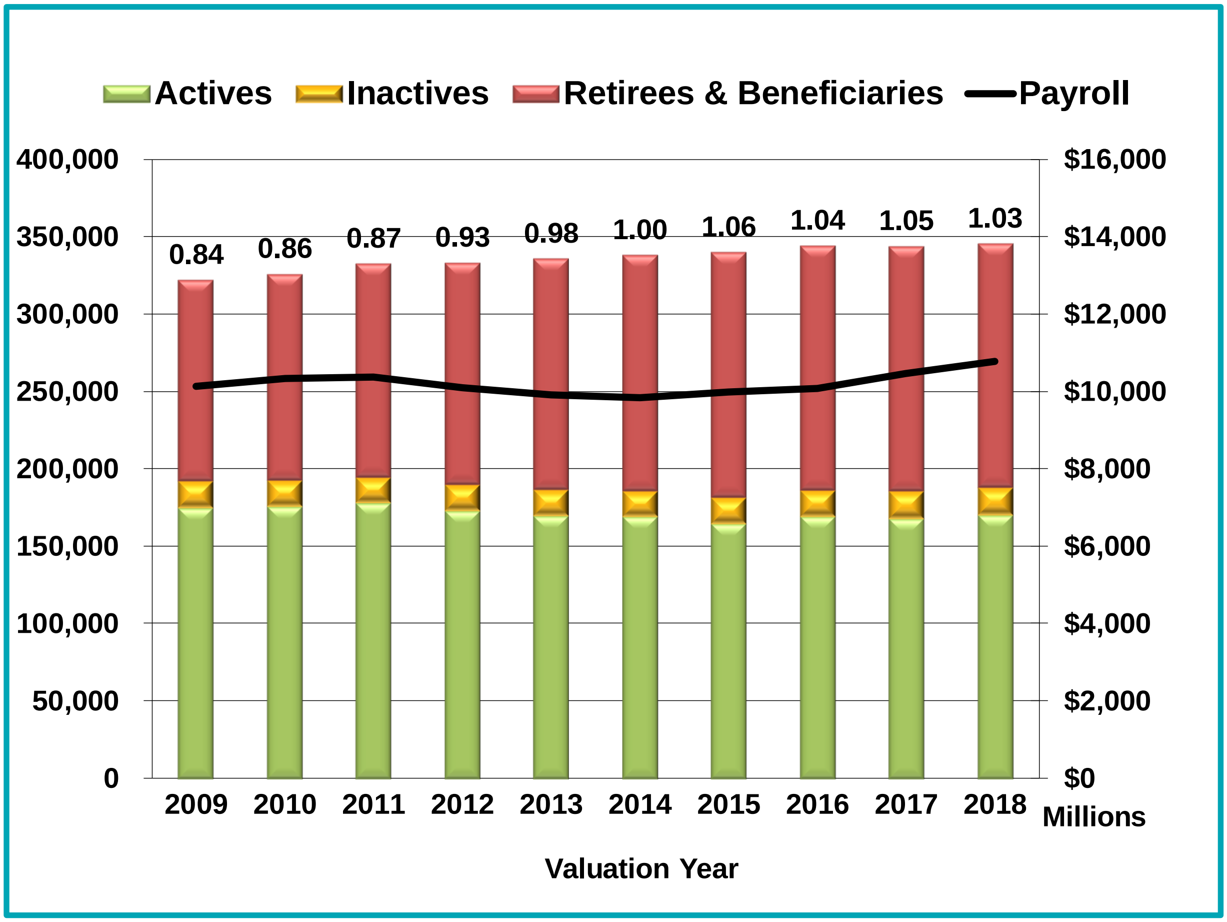


Participant Trends

The chart below shows the membership counts of the Plan at successive valuations. The numbers, which appear above each bar, represent the ratio of the number of inactive members (retirees, reemployed retirees, and inactive members eligible for deferred allowances) to active members at each valuation date. We refer to this ratio as the support ratio.

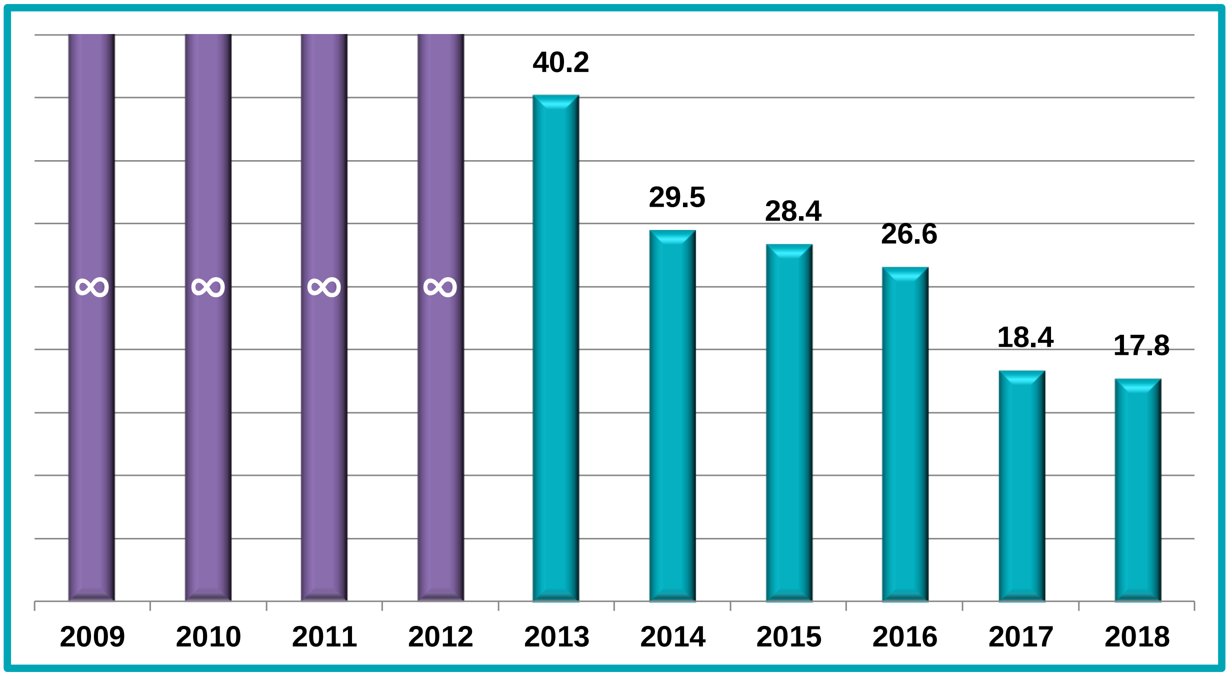
The support ratio has been generally increasing since 2009, which is common among mature systems.

Finally, the black line in the chart below shows the total covered payroll over the period and is read using the right-hand scale.



Amortization Periods

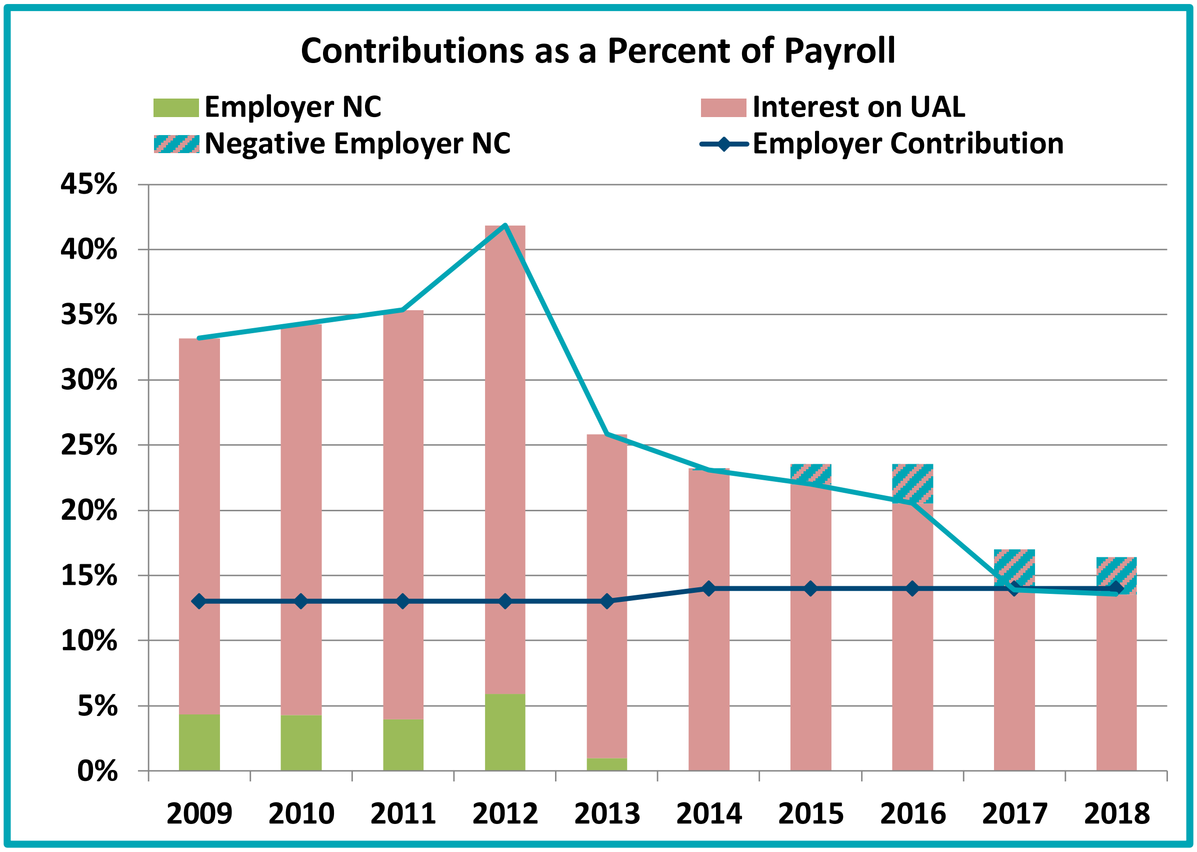
The chart below shows the effective amortization period for funding the UAL. As can be seen in the chart, the fixed rate contributions for STRS for the years 2009 through 2012 were not sufficient to amortize the UAL over any period. However, since then, there has been an effective amortization period and it has been steadily decreasing from 2013 through 2018. The pension reform changes in recent years, including allocation of the entire 14.0% employer contribution to pension and the reduction of the COLA to 0% have contributed to the decrease in the amortization period.



Contributions versus "Tread Water"

The next chart compares the fixed employer contribution rate to a rate we refer to as the "Tread Water Rate". The tread water rate is that rate of payroll which if contributed would result in the UAL remaining the same, neither increasing nor decreasing, in the following year. That happens when the full normal cost plus interest on the UAL is contributed.

As can be seen on the chart, the fixed employer contribution rate for all years shown in the chart was well below the tread water rate prior to 2017. Then, for years 2017 and 2018, the fixed employer contribution rate was practically equal to the tread water rate. The negative employer normal cost shown in years 2015 through 2018 is due to member contributions exceeding the total normal cost, which is then used to partially pay for the interest on the UAL.



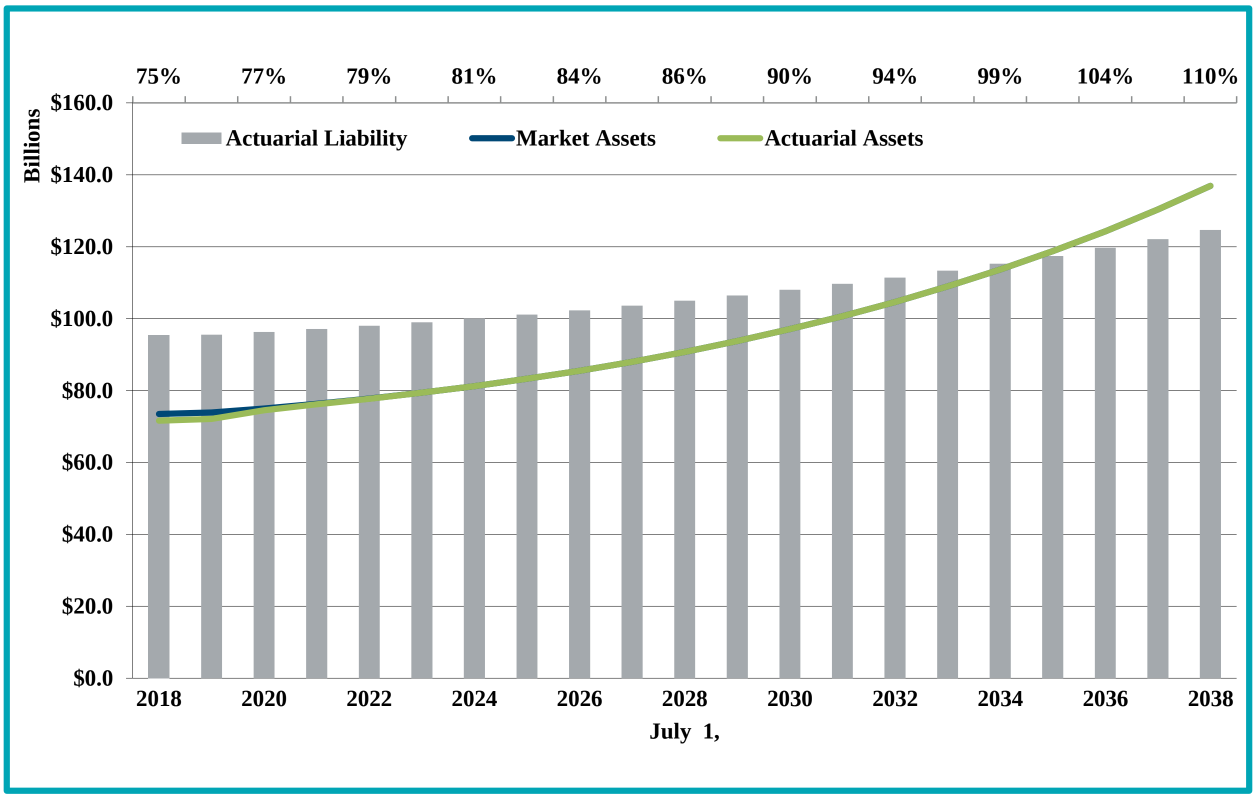
Future Expected Financial Trends

The analysis of projected financial trends is perhaps the most important component of this valuation. The chart presented in this section shows the expected progress of System's funding status over the next 20 years. Our baseline projection that follows assumes all assumptions will be exactly realized and that the employer and members will continue to contribute the same percent of payroll as they are currently contributing for all future years.

The following projection chart compares the market value of assets (blue line) and the actuarial or smoothed value of assets (green line) to the System's actuarial liabilities (gray bars). In addition, at the top of the chart, we show the System's funded ratio on an actuarial value of assets basis (ratio of actuarial value of assets to actuarial liabilities). The years shown in the chart signify the valuation date as of July 1 of the labelled year.

The System's funded ratio on an actuarial value of assets basis, shown along the top of the graph, is projected to improve from the current level of 75% to 110% by the 2038 valuation.

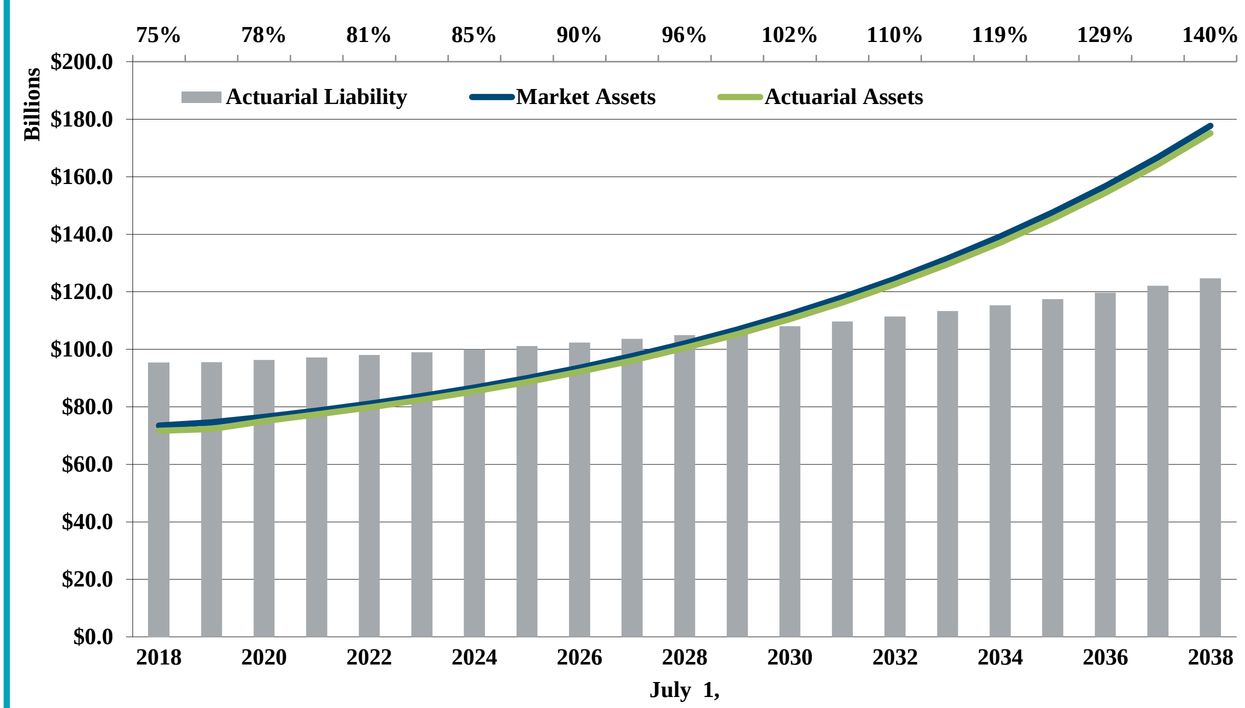
This baseline projection assumes annual return on assets each year to be 7.45%.



Sensitivity Testing

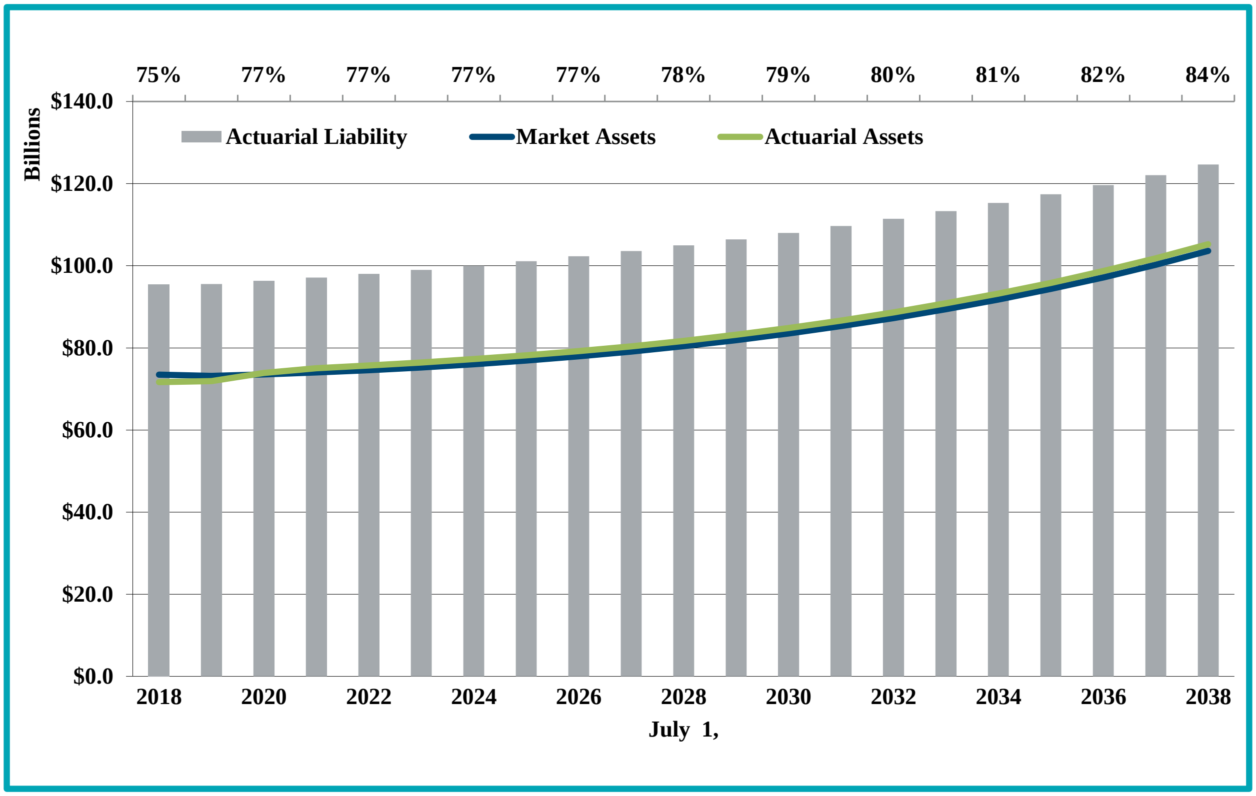
We next test the sensitivity of the Plan's funded status to investment earnings that are 1% above and 1% below the assumed 7.45%.

With 8.45% returns the 2038 funded ratio increases from 110% to 140%.



SECTION I – BOARD SUMMARY

Assuming the annual return each year to be 6.45% will result in the 2038 funded ratio dropping from 110% to 84%.



SECTION II – ASSETS

Pension plan assets play a key role in the financial operation of the Plan and in the decisions that the Trustees may make with respect to future deployment of those assets. The level of assets, the allocation of assets among asset classes, and the methodology used to measure assets will likely impact benefit levels, employer contributions, and the ultimate security of Participants' benefits.

In this section, we present detailed information on the plan assets including:

- **Disclosure** of the plan assets as of July 1, 2017 and July 1, 2018;
- Statement of the **changes** in market values during the year;
- Development of the **Actuarial Value of Assets**; and
- An assessment of **investment performance.**

Disclosure

There are two types of asset values disclosed in this valuation, the market value of assets and the actuarial value of assets. The market value represents a "snap-shot" or "cash-out" value, which provides the principal basis for measuring financial performance from one year to the next. Market values, however, can fluctuate widely with corresponding swings in the marketplace. As a result, market values are usually not as suitable for long-range planning as are the actuarial value of assets, which reflect smoothing of annual investment returns.

SECTION II – ASSETS

Table II-1 below discloses and compares each asset value as of June 30, 2017 and June 30, 2018.

Table II-1
Statement of Market Value of Assets as of June 30,

	2018			2017	
	Defined Benefit	**Defined Contribution**	**Total**	**Total**	**% Change**
Assets					
Cash & Short-Term Investments	$ 1,261,955,605	$ 131,071,887	$ 1,393,027,492	$ 1,177,491,002	18.30%
Receivables	896,990,562	160,514	897,151,076	904,138,479	(0.77%)
Fixed Income	14,644,663,208	310,603,523	14,955,266,731	14,008,292,415	6.76%
Domestic Equities	20,846,728,008	773,062,962	21,619,790,970	21,297,808,287	1.51%
International Equities	16,802,420,569	140,802,608	16,943,223,177	18,189,635,187	(6.85%)
Real Estate	9,262,065,135	103,033,260	9,365,098,395	9,369,158,425	(0.04%)
Alternative Investments	11,788,798,845	0	11,788,798,845	10,018,301,017	17.67%
Invested Securities Lending Capital	1,716,920,855	0	1,716,920,855	1,284,461,150	33.67%
Capital Assets	249,428,228	0	249,428,228	246,872,752	1.04%
Accumulated Depreciation	(165,871,520)	0	(165,871,520)	(159,711,679)	3.86%
Total Assets	**$ 77,304,099,495**	**$ 1,458,734,754**	**$ 78,762,834,249**	**$ 76,336,447,035**	3.18%
Liabilities					
Securities Purchased and Other Investment Liabilities	$ (200,871,482)	$ 0	$ (200,871,482)	$ (239,498,894)	(16.13%)
Debt on Real Estate Investments	(1,767,714,541)	0	(1,767,714,541)	(2,325,341,107)	(23.98%)
Accrued Expenses and Other Liabilities	(34,298,513)	0	(34,298,513)	(31,060,149)	10.43%
Obligations Under Security Lending Program	(1,716,688,097)	0	(1,716,688,097)	(1,283,958,669)	33.70%
Net Pension Liability	(126,959,786)	0	(126,959,786)	(85,362,097)	48.73%
Total Liabilities	**$ (3,846,532,419)**	**$ 0**	**$ (3,846,532,419)**	**$ (3,965,220,916)**	(2.99%)
Market Value of Assets	**$ 73,457,567,076**	**$ 1,458,734,754**	**$ 74,916,301,830**	**$ 72,371,226,119**	**3.52%**

SECTION II – ASSETS

Actuarial Value of Assets

The actuarial value of assets represents a "smoothed" value developed by the actuary to reduce, or eliminate, erratic results which could develop from short-term fluctuations in the market value of assets. For this Plan, the actuarial value of assets is based on the market value of assets with a four-year phase-in of actual investment return in excess of (or less than) expected investment income. Expected investment income is determined using the assumed investment return rate and the actuarial value of assets (adjusted for receipts and disbursements during the year). The actual investment return for this purpose is determined net of all investment and administrative expenses. The actuarial value is further adjusted, if necessary, to be within 9% of the market value.

The next three tables show how the actuarial value of assets is developed. Table II-2 shows the changes in the market and actuarial value of assets, Table II-3 shows the development of the gain/(loss) on assets for purposes of the determining the actuarial value of assets, and Table II-4 shows the development of the actuarial value of assets.

SECTION II – ASSETS

Table II-2
Changes in Value of Assets[1]

		Market Value of Assets		Actuarial Value of Assets
1. **Value of Assets - June 30, 2017**	**$**	**71,118,707,206**	**$**	**70,963,693,416**
(a) Prior year adjustment, GASB 75		(39,729,686)		
(b) Restated Value of Assets - June 30, 2017	**$**	**71,078,977,520**		
2. Calculation of Net Cash Flow				
(a) Member Contributions	$	1,479,151,091	$	1,479,151,091
(b) Employer Contributions		1,565,679,329		1,565,679,329
(c) Transfers between Plans/from Other Systems		43,248,105		43,248,105
(d) Benefit Payments and Refunds		(7,272,096,118)		(7,272,096,118)
(e) **Net Cash Flow**	**$**	**(4,184,017,593)**	**$**	**(4,184,017,593)**
3. **Value of Assets - June 30, 2018**	**$**	**73,457,567,076**	**$**	**71,656,623,566**
4. Net Investment Income [3. - 1.(b) - 2.(e)]	$	6,562,607,149	$	4,876,947,743
5. Average Value of Assets [1. + 1/2*2.(e)]	$	68,986,968,724	$	68,871,684,620
6. Rate of Return [4. / 5.]		9.51%		7.08%
7. Assumed Rate of Return		7.45%		7.45%
8. Expected Net Investment Income [5. * 7.]	$	5,139,529,170	$	5,130,940,504
9. Investment Gain/(Loss) [4. - 8.]	$	1,423,077,979	$	(253,992,761)

[1]Only includes assets for the Defined Benefit plan. Defined Contribution plan assets are not included.

SECTION II – ASSETS

Table II-3
Development of Gain/(Loss) on Assets for Smoothing[1]

1. Actuarial Value of Assets at June 30, 2017	$ 70,963,693,416
2. Calculation of Net Cash Flow	
(a) Member Contributions	1,479,151,091
(b) Employer Contributions	1,565,679,329
(c) Transfers between Plans/from Other Systems	43,248,105
(d) Benefit Payments and Refunds	(7,272,096,118)
(e) Net Cash Flow	(4,184,017,593)
3. Average Actuarial Value of Assets [1. + 1/2*2.(e)]	68,871,684,620
4. Expected Income	5,130,940,504
5. Actual Income on Market Value of Assets	6,562,607,149
6. Gain/(Loss) for year ended June 30, 2018	$ 1,431,666,645

[1]Only includes assets for the Defined Benefit plan. Defined Contribution plan assets are not included.

SECTION II – ASSETS

Table II-4
Development of Actuarial Value of Assets

	Original Gain/(Loss)	Deferred Portion
Defer 0% of 2015 Gain/(Loss)	(1,353,832,000)	0
Defer 25% of 2016 Gain/(Loss)	(4,778,548,000)	(1,194,637,000)
Defer 50% of 2017 Gain/(Loss)	3,843,661,053	1,921,830,526
Defer 75% of 2018 Gain/(Loss)	1,431,666,645	1,073,749,984
Total Deferred Gain/(Loss) for AVA Calculation		$ 1,800,943,510
Market Value of Assets at June 30, 2018		$ 73,457,567,076
Total Unrecognized Gain/(Loss)		1,800,943,510
Preliminary Actuarial Value of Assets at June 30, 2018		$ 71,656,623,566
Adjustment for 91% / 109% corridor		0
Actuarial Value of Pension Assets at June 30, 2018		71,656,623,566
Defined Contribution Plan Assets at June 30, 2018		1,458,734,754
Total Actuarial Value of Assets at June 30, 2018		73,115,358,320
Actuarial Value as a Percent of Market Value:		97.6%

Investment Performance

The Market Value of Assets (MVA) earned 9.51% during the fiscal year ending June 30, 2018, which is more than the assumed 7.45% return for the period ending June 30, 2018. A return of 7.08% was experienced on the Actuarial Value of Assets (AVA), resulting in an actuarial loss for the year. Table II-5 shows the returns over the last 20 years.

Table II-5
Historic Investment Return

Year Ending June 30,	Market Value	Actuarial Value
2018	9.5%	7.1%
2017	14.1%	9.0%
2016	0.4%	8.9%
2015	5.2%	9.5%
2014	16.5%	13.3%
2013	13.5%	12.1%
2012	1.7%	8.5%
2011	22.5%	9.2%
2010	13.5%	6.6%
2009	-22.0%	-17.7%
2008	-5.6%	7.0%
2007	20.6%	18.4%
2006	13.5%	11.0%
2005	11.9%	5.7%
2004	17.2%	9.4%
2003	1.8%	1.6%
2002	-8.3%	-7.8%
2001	-6.5%	6.7%
2000	10.3%	13.1%
1999	12.5%	13.4%
Average Returns		
Last 5 years:	9.0%	9.5%
Last 10 years:	6.8%	6.3%
Last 15 years:	8.2%	7.6%
Last 20 years:	6.5%	6.9%

SECTION III – LIABILITIES

In this section, we present detailed information on the plan liabilities including:

- **Disclosure** of the plan liabilities as of July 1, 2017 and July 1, 2018, and
- Statement of **changes** in these liabilities during the year.

Disclosure

Two types of liabilities are calculated and presented in this report. Each type is distinguished by the people ultimately using the figures and the purpose for which they are using them.

- **Present Value of Future Benefits:** Used for measuring all future plan obligations, represents the amount of money needed today to fully fund all benefits of the plan both earned as of the valuation date and those to be earned in the future by current plan participants, under the current plan provisions.

- **Actuarial Liability:** Used for funding calculations, this liability is calculated as of the valuation date as the present value of benefits allocated to service prior to that date using the entry age normal funding method.

These liability amounts are not appropriate for measuring a settlement of the Plan's liabilities either by purchase of annuities or payment of lump sums.

Table III-1, which follows, discloses each of these liabilities for the current and prior valuations.

SECTION III – LIABILITIES

Table III-1
Liability Detail

	July 1, 2018			July 1, 2017
	Defined Benefit	Combined	Total	Total
Present Value of Future Benefits				
Active Member Benefits	$ 36,965,684,356	$ 414,748,287	$ 37,380,432,643	$ 34,960,479,724
Reemployed Retiree Benefits	275,162,621	-	275,162,621	420,385,672
Inactive Benefits				
(i) Deferred Annuity	1,231,827,904	10,118,133	1,241,946,037	1,164,006,262
(ii) Contribution Refund	335,513,049	372,091	335,885,140	324,895,384
Retiree & Beneficiary Benefits				
(i) Annuity & Pension Reserve Fund	67,463,540,877	31,208,833	67,494,749,710	68,610,247,957
(ii) Survivor's Benefit Fund	1,141,160,505	-	1,141,160,505	1,113,145,714
Present Value of Future Benefits (PVB)[1]	**$ 107,412,889,312**	**$ 456,447,344**	**$ 107,869,336,656**	**$ 106,593,160,713**
Actuarial Liability				
Active Member Benefits	$ 24,731,815,023	$ 224,602,762	$ 24,956,417,785	$ 23,241,240,560
Reemployed Retiree Benefits	275,162,621	-	275,162,621	420,385,672
Inactive Benefits	1,567,340,953	10,490,224	1,577,831,177	1,488,901,646
Retiree & Beneficiary Benefits	68,604,701,382	31,208,833	68,635,910,215	69,723,393,671
Defined Benefit Plan Actuarial Liability	95,179,019,979	266,301,819	95,445,321,798	94,873,921,549
Defined Contribution Account Balances	1,458,734,754	-	1,458,734,754	1,252,518,913
Total Actuarial Liability (AL)	**$ 96,637,754,733**	**$ 266,301,819**	**$ 96,904,056,552**	**$ 96,126,440,462**
Actuarial Value of Assets (AVA)			$ 73,115,358,320	$ 72,216,212,329
Net Unfunded/(Surplus) Actuarial Liability (AL-AVA)			**$ 23,788,698,232**	**$ 23,910,228,133**

[1] Excludes the Defined Contribution Account Balances.

Changes in Liabilities

Each of the liabilities disclosed in the prior table are expected to change at each valuation. The components of that change, depending upon which liability is analyzed, can include:

- New hires since the last valuation
- Benefits accrued since the last valuation
- Plan amendments changing benefits
- Passage of time which adds interest to the prior liability
- Benefits paid to retirees since the last valuation
- Participants retiring, terminating, or dying at rates different than expected
- A change in actuarial or investment assumptions
- A change in the actuarial funding method

Unfunded liabilities will change due to each item above and also from changes in plan assets resulting from:

- Employer contributions differing from expected
- Investment earnings differing from expected
- A change in the method used to measure plan assets

In each valuation, we report on those elements of change which are of particular significance, potentially affecting the long-term financial outlook of the Plan. Below we present key changes in liabilities since the last valuation.

SECTION III – LIABILITIES

In the table that follows, we show the components of change in the actuarial liability between July 1, 2017 and July 1, 2018.

Table III-2

Changes in Defined Benefit Actuarial Liability

Liabilities as of July 1, 2017	$ 94,873,921,549
Liabilities as of July 1, 2018	95,445,321,798
Liability Increase (Decrease)	571,400,249
Change Due to:	
Method Changes (Change in Actuary)	(236,418,309)
Benefit Changes	0
Assumption Changes	0
Experience (Gain)/Loss	114,037,119
Benefits Accumulated and Other Sources	693,781,439

In addition, we break down the change in actuarial liability further by showing the total actuarial (gain)/loss by source, as shown in Table III-3 below.

Table III-3

Experience (Gain)/Loss by Source as of July 1, 2018

Salary/Service Increase	$ (180,810,461)
Retirement Experience	120,603,653
Plan Reselection	N/A
Retiree Mortality	9,495,064
New Entrants	37,954,417
Data composition and other changes	126,794,446
Experience (Gain)/Loss	$ 114,037,119

SECTION IV – CONTRIBUTIONS

In the process of evaluating the financial condition of any pension plan, the actuary analyzes the assets and liabilities to determine what level (if any) of contributions is needed to properly maintain the funding status of the plan. Typically, the actuarial process will use a funding technique that will result in a pattern of contributions that are both stable and predictable.

Under Chapter 3307 of the Ohio Revised Code, members of the Defined Benefit Plan contribute 14.00% of payroll and members of the Combined Plan contribute 2.00% of payroll. Employers contribute 14.00% of payroll for members in the Defined Benefit Plan and the Combined Plan. Beginning in fiscal year 2014, the Board allocated the total employer contribution rate towards pension and survivor benefits, and made no allocation to health care. Contributions in excess of the total normal cost are used to fund the unfunded actuarial liability. Table IV-1 shows the development of the employer contribution rates.

Table IV-1
Development of Employer Contribution Rate

	2018			2017
	Defined Benefit	**Combined**	**Total**	**Total**
Valuation Results				
Total Actuarial Liability	$ 96,637,754,733	$ 266,301,819	$ 96,904,056,552	$ 96,126,440,462
Actuarial Value of Pension Assets			73,115,358,320	72,216,212,329
Unfunded Actuarial Liability			$ 23,788,698,232	$ 23,910,228,133
Total Normal Cost	$ 1,114,636,290	$ 14,812,893	$ 1,129,449,183	$ 1,075,333,908
Normal Cost Rate	10.91%	4.00%	10.67%	10.45%
Member Contribution Rate	14.00%	2.00%	13.58%	13.61%
Allocation of Employer Contribution Rate				
Employer Normal Cost Rate	(3.09%)	2.00%	(2.91%)	(3.16%)
Unfunded Actuarial Liability Rate	17.09%	12.00%	16.91%	17.16%
Total Employer Pension Contribution Rate	14.00%	14.00%	14.00%	14.00%
Health Care Rate	0.00%	0.00%	0.00%	0.00%
Total Employer Contribution Rate	14.00%	14.00%	14.00%	14.00%

SECTION IV – CONTRIBUTIONS

In addition to the above mentioned contributions, employers contribute 4.47% of payroll for members of the Defined Contribution Plan and the Alternative Retirement Plan. These contributions are also used to fund the pension unfunded actuarial liability. Based on these contributions, the valuation indicates that the funding period to amortize the unfunded actuarial liability is 17.8 years. Table IV-2 shows the development of the funding period based on these contributions.

Table IV-2
Development of Funding Period Based on Employer Contribution Rate

	2018 Total		2017 Total	
Valuation Results				
Total Defined Benefit Plan Payroll	$	11,125,398,457	$	10,773,497,180
STRS Defined Contribution Plan Payroll	$	425,037,922	$	404,397,570
Alternative Retirement Plan Payroll	$	757,568,817	$	725,966,660
Total Actuarial Accrued Liability	$	96,904,056,552	$	96,126,440,462
Acturarial Value of Pension Assets		73,115,358,320		72,216,212,329
Unfunded Actuarial Liability (UAL)	$	23,788,698,232	$	23,910,228,133
UAL Rate for Defined Benefit Plan*		16.91%		17.16%
Defined Benefit Plan UAL Contribution*	$	1,881,024,803	$	1,857,689,001
Defined Contribution Plan UAL Contribution*		18,999,195		18,076,571
Alternative Retirement Plan UAL Contribution*		33,863,326		32,450,710
Total Contribution for UAL*	$	1,933,887,324	$	1,908,216,282
Amortization Period*		17.8 Years		18.4 Years

*Assumes payments are made throughout the year

Under the Board's current funding policy, the Actuarially Determined Contribution contains two components: the employer normal cost and an amortization of the unfunded actuarial liability (UAL). For this purpose, the funding method employed is the **Entry Age Normal (EAN) Actuarial Cost Method**. Under this funding method, a total normal cost rate is determined as a level percentage of payroll for each active member. The normal cost rate multiplied by payroll equals the total normal cost for each member. The total anticipated member contributions for the year are then subtracted from the sum of the total normal cost to arrive at the employer normal cost.

The EAN actuarial liability is the difference between the present value of future benefits and the present value of future normal costs. The difference between this EAN actuarial liability and the

SECTION IV – CONTRIBUTIONS

actuarial value of assets is the unfunded actuarial liability (UAL). Under the Board's funding policy, the UAL is amortized over a closed 30 year period that began July 1, 2015 as a level percent of pay, assuming a 3.00% annual payroll growth. As of July 1, 2018, the remaining amortization period is 27 years.

Table IV-3 shows the development of the actuarially determined contribution rate and contribution rate sufficiency. Based on this valuation, the actuarially determined contribution rate is 10.10% of payroll, which is less than the 14.00% rate of payroll employers are currently contributing for members of the Defined Benefit and Combined Plans. Therefore, as of this valuation, and assuming all assumptions are realized, the current employer contribution rate of 14.00% of payroll is sufficient to cover the actuarially determined contribution rate under the Board's funding policy.

Table IV-3
Actuarially Determined Contribution and Contribution Rate Sufficiency

	2018 Total	2017 Total
Valuation Results		
Total Defined Benefit Plan Valuation Payroll	$ 11,125,398,457	$ 10,773,497,180
STRS Defined Contribution Plan Payroll	$ 425,037,922	$ 404,397,570
Alternative Retirement Plan Payroll	$ 757,568,817	$ 725,966,660
Total Actuarial Accrued Liability	$ 96,904,056,552	$ 96,126,440,462
Acturarial Value of Pension Assets	73,115,358,320	72,216,212,329
Unfunded Actuarial Liability	$ 23,788,698,232	$ 23,910,228,133
Amortization Period	27	28
Amortization Payment	$ 1,500,007,141	$ 1,478,955,433
Offset for Defined Contribution Contribution to UAL*	18,999,195	18,076,571
Offset for Alternative Retirement Plan Contribution to UAL*	33,863,326	32,450,710
UAL Amortization Payment from Defined Benefit Plan*	$ 1,447,144,619	$ 1,428,428,152
Defined Benefit Plan Rate to Amortize UAL	13.01%	13.26%
Employer Normal Cost Rate	(2.91%)	(3.16%)
Actuarial Determined Contribution Rate*	**10.10%**	**10.10%**
Statuatory Employer Contribution	14.00%	14.00%
Contribution Sufficiency/(Deficiency)	3.90%	3.90%

*Assumes payments are made throughout the year

SECTION V – ACCOUNTING STATEMENT INFORMATION

GFOA Recommended Information

The Government Finance Officers Association (GFOA) maintains a checklist of items to be included in a public retirement plan's Comprehensive Annual Financial Report (CAFR) in order to receive recognition for excellence in financial reporting.

We have prepared the following exhibits:

- Table VI-1: Analysis of Financial Experience
- Table VI-2: Solvency Test
- Table VI-3: Actuarial Funding Ratio and Funding Period

Table V-1
Analysis of Financial Experience (in thousands)
Gains and (Losses) in Unfunded Actuarial Liability During Year Ended June 30
Resulting from Differences Between Assumed Experience and Actual Experience

Type of Activity	2014	2015	2016	2017	2018
Investment income	$3,333,931	$1,068,184	$774,260	$ 857,418	$ (253,993)
Payroll growth	(51,750)	(26,173)	(40,874)	7,091	N/A
Salary increases	413,619	21,385	236,054	279,058	180,810
Retirement and other separation experience	(327,782)	(1,064,240)	(333,342)	(316,922)	(285,353)
Death after Retirement	(185,841)	(223,251)	(336,967)	27,307	(9,495)
Final plan reselection	(3,807)	(8,240)	(9,569)	(1,403)	N/A
Gain (or loss) during year	$ 3,178,370	$ (232,335)	$ 289,562	$ 852,549	$ (368,031)
Gain (or loss) due to assumption/method/plan amendment changes	-	-	-	415,862	236,418
Composite gain (or loss) during the year	$ 3,178,370	$ (232,335)	$ 289,562	$ 1,268,411	$ (131,613)

SECTION V – ACCOUNTING STATEMENT INFORMATION

Table V-2

Solvency Test (Dollars in Thousands)*

	Aggregate Actuarial Liabilities for						
Valuation Date July 1,	Active Member Contributions (1)	Retirees & Beneficiaries (2)	Active Members Employer Financed Portion (3)	Actuarial Value of Assets (Excl Healthcare)	Portion of Actuarial Liabilities Covered by Actuarial Value of Assets (1)	(2)	(3)
2018	$ 15,440,336	$ 68,911,073	$ 14,324,150	$ 73,115,358	100%	84%	0%
2017	$ 13,668,834	$ 69,723,394	$ 12,734,213	$ 72,216,212	100%	84%	0%
2016	$ 12,498,469	$ 74,282,592	$ 13,975,362	$ 70,114,637	100%	78%	0%
2015	$ 11,473,309	$ 74,340,699	$ 13,200,646	$ 68,655,999	100%	77%	0%
2014	$ 11,477,457	$ 69,776,259	$ 14,913,341	$ 66,657,175	100%	79%	0%
2013	$ 10,962,886	$ 68,075,440	$ 15,328,367	$ 62,590,786	100%	76%	0%
2012	$ 10,985,246	$ 68,111,175	$ 27,205,420	$ 59,489,508	100%	71%	0%
2011	$ 10,907,611	$ 62,441,601	$ 25,416,993	$ 58,110,495	100%	76%	0%
2010	$ 10,641,167	$ 57,754,654	$ 26,324,848	$ 55,946,259	100%	78%	0%
2009	$ 10,295,816	$ 54,909,046	$ 26,236,093	$ 54,902,859	100%	81%	0%

*Includes Defined Contribution Plan

SECTION V – ACCOUNTING STATEMENT INFORMATION

Table V-3
Actuarial Funded Ratio and Funding Period (Dollars in Thousands)

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Liability (b)	Unfunded Actuarial Liability (b) - (a)	Funded Ratio (a) / (b)	Funding Period
7/1/2018	$ 73,115,358	$ 96,904,057	$ 23,788,698	75.5%	17.8 years
7/1/2017	$ 72,216,212	$ 96,126,440	$ 23,910,228	75.1%	18.4 years
7/1/2016	$ 70,114,637	$ 100,756,422	$ 30,641,785	69.6%	26.6 years
7/1/2015	$ 68,655,999	$ 99,014,654	$ 30,358,655	69.3%	28.4 years
7/1/2014	$ 66,657,175	$ 96,167,057	$ 29,509,882	69.3%	29.5 years
7/1/2013	$ 62,590,786	$ 94,366,694	$ 31,775,908	66.3%	40.2 years
7/1/2012	$ 59,489,508	$ 106,301,841	$ 46,812,333	56.0%	Infinite Years
7/1/2011	$ 58,110,495	$ 98,766,204	$ 40,655,709	58.8%	Infinite Years
7/1/2010	$ 55,946,259	$ 94,720,669	$ 38,774,410	59.1%	Infinite Years
7/1/2009	$ 54,902,859	$ 91,440,955	$ 36,538,096	60.0%	Infinite Years

SECTION VI – GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2018

Overview

The purpose of this section is to provide accounting and financial disclosure information under Government Accounting Standards Board Statements 67 and 68 (GASB 67 and 68) for the State Teachers Retirement System of Ohio as of June 30, 2018. This information includes:

- Determination of the Discount Rate,
- Change in Net Pension Liability,
- Sensitivity of the Net Pension Liability to changes in the discount rate,
- Schedule of Changes in the Net Pension Liability and Related Ratios,
- Schedule of Employer Contributions,
- Disclosure of Collective Deferred Inflows and Outflows, including a detailed schedule of deferred items, and
- Calculation of Collective Annual Pension Expense.

The membership data, actuarial assumptions and plan provisions for the GASB 67 and 68 calculations are the same as are described within Appendices A, B and C of this Actuarial Valuation Report.

Determination of Discount Rate

For purposes of determining the discount rate, we have performed a cash flow projection as described under Paragraph 41 of GASB Statement 67. With regard to the employer and employee contributions used for this projection, we have assumed that future employer and employee contributions would be made at the current rates set by State statute and that 100% of the contributions would be made to the pension plan, with none of these future contributions paid to the post-employment health care plan. Based upon these assumptions, the plan's fiduciary net position was projected to be available to make all future benefit payments for current plan members as of June 30, 2018.

Note Disclosures

The Table VI-1 shows the changes in the Total Pension Liability, the Plan Fiduciary Net Position (i.e., fair value of plan assets), and the Net Pension Liability during the Measurement Year.

Table VI-1
Change in Net Pension Liability

	Increase (Decrease)		
	Total Pension Liability (a)	**Plan Fiduciary Net Position (b)**	**Net Pension Liability (a) - (b)**
Balances at 6/30/2017	$ 96,126,440,462	$ 72,371,226,119	$ 23,755,214,343
Changes for the year:			
Service cost	1,075,333,908		1,075,333,908
Interest	6,974,352,400		6,974,352,400
Changes of benefits	0		0
Differences between expected and actual experience	31,731,963		31,731,963
Changes of assumptions	0		0
Contributions - employer*		1,634,027,228	(1,634,027,228)
Contributions - member		1,580,429,592	(1,580,429,592)
Net investment income**		6,697,727,752	(6,697,727,752)
Benefit payments	(7,303,802,181)	(7,303,802,181)	0
Administrative expense		(63,306,680)	63,306,680
Net changes	777,616,090	2,545,075,711	(1,767,459,622)
Balances at 6/30/2018	$ 96,904,056,552	$ 74,916,301,830	$ 21,987,754,722

*Includes Defined Contribution and Alternative Retirement Plan.
**Net investment income reflects prior period adjustment of $39.7 million.

There were no changes in benefits or assumptions during the year.

Total contributions and investment income were greater than the service cost, interest cost, administrative expenses and unfavorable experience, resulting in a decrease in the NPL of $1.8 billion. The NPL remaining as of June 30, 2018 is $22.0 billion.

SECTION VI – GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2018

Changes in the discount rate affect the measurement of the TPL. Lower discount rates produce a higher TPL and higher discount rates produce a lower TPL. Because the discount rate does not affect the measurement of assets, the percentage change in the NPL can be very significant for a relatively small change in the discount rate. The table below shows the sensitivity of the NPL to the discount rate.

Table VI-2
Sensitivity of Net Pension Liability to Changes in Discount Rate

	1% Decrease 6.45%	Discount Rate 7.45%	1% Increase 8.45%
Total Pension Liability	$ 107,026,523,102	$ 96,904,056,552	$ 88,336,761,969
Plan Fiduciary Net Position	74,916,301,830	74,916,301,830	74,916,301,830
Net Pension Liability	$ 32,110,221,272	$ 21,987,754,722	$ 13,420,460,139
Plan Fiduciary Net Position as a Percentage of the Total Pension Liability	70.0%	77.3%	84.8%

A one percent decrease in the discount rate increases the TPL by approximately 10.4% and increases the NPL by approximately 46.0%. A one percent increase in the discount rate decreases the TPL by approximately 8.8% and decreases the NPL by approximately 39.0%.

SECTION VI - GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2018

Required Supplementary Information

The schedules of Required Supplementary Information generally start with one year of information as of the implementation of GASB 67, but eventually will need to build up to 10 years of information. The schedule below shows the changes in NPL and related ratios required by GASB for the current and prior years.

Table VI-3
Schedule of Changes in Net Pension Liability and Related Ratios

	FYE 2018	FYE 2017
Total Pension Liability		
Service cost	$ 1,075,333,908	$ 1,067,687,383
Interest (includes interest on service cost)	6,974,352,400	7,611,942,025
Changes of benefit terms	0	(12,353,691,031)
Differences between expected and actual experience	31,731,963	(239,322,183)
Changes of assumptions	0	6,494,407,977
Benefit payments, including refunds of member contributions	(7,303,802,181)	(7,211,006,198)
Net change in total pension liability	**$ 777,616,090**	**$ (4,629,982,027)**
Total pension liability - beginning	**96,126,440,462**	**100,756,422,489**
Total pension liability - ending	**$ 96,904,056,552**	**$ 96,126,440,462**
Plan fiduciary net position		
Contributions - employer*	$ 1,634,027,228	$ 1,590,868,100
Contributions - member	1,580,429,592	1,537,676,856
Net investment income	6,697,727,752	9,313,931,483
Benefit payments, including refunds of member contributions	(7,303,802,181)	(7,211,006,198)
Administrative expense	(63,306,680)	(63,652,306)
Net change in plan fiduciary net position	**$ 2,545,075,711**	**$ 5,167,817,935**
Plan fiduciary net position - beginning	**72,371,226,119**	**67,203,408,184**
Plan fiduciary net position - ending	**$ 74,916,301,830**	**$ 72,371,226,119**
Net pension liability - ending	**$ 21,987,754,722**	**$ 23,755,214,343**
Plan fiduciary net position as a percentage of the total pension liability	77.31%	75.29%
Covered payroll*	$ 11,923,688,122	$ 11,557,146,918
Net pension liability as a percentage of covered payroll	184.40%	205.55%

*Includes Defined Contribution and Alternative Retirement Plans.

SECTION VI – GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2018

If an Actuarially Determined Contribution is calculated, the following schedule is required. An Actuarially Determined Contribution is a contribution amount determined in accordance with Actuarial Standards of Practice.

Table VI-4
Schedule of Employer Contributions

	FYE 2018	FYE 2017	FYE 2016	FYE 2015	FYE 2014
Actuarially Determined Contribution*	$ 1,056,430,306	$ 1,054,862,000	$ 1,178,129,000	$ 1,368,602,000	$ 1,489,734,000
Contributions in Relation to the Actuarially Determined Contribution*	1,565,679,329	1,514,285,000	1,466,938,000	1,449,165,000	1,325,141,000
Contribution Deficiency/(Excess)	$ (509,249,023)	$ (459,423,000)	$ (288,809,000)	$ (80,563,000)	$ 164,593,000
Covered Payroll*	$ 10,775,526,239	$ 10,459,706,000	$ 10,069,269,000	$ 9,985,181,000	$ 9,833,028,000
Contributions as a Percentage of Covered Payroll	14.53%	14.48%	14.57%	14.51%	13.48%

	FYE 2013	FYE 2012	FYE 2011	FYE 2010	FYE 2009
Actuarially Determined Contribution*	$ 2,910,537,000	$ 3,248,651,000	$ 2,715,523,000	$ 2,623,624,000	$ 1,502,240,000
Contributions in Relation to the Actuarially Determined Contribution*	1,327,862,000	1,349,561,000	1,379,104,000	1,374,327,000	1,347,741,000
Contribution Deficiency/(Excess)	$ 1,582,675,000	$ 1,899,090,000	$ 1,336,419,000	$ 1,249,297,000	$ 154,499,000
Covered Payroll*	$ 9,917,911,000	$ 10,102,509,000	$ 10,369,367,000	$ 10,341,512,000	$ 10,122,141,000
Contributions as a Percentage of Covered Payroll	13.39%	13.36%	13.30%	13.29%	13.31%

*Excludes the Defined Contribution and Alternative Retirement Plans.

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SECTION VI – GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2018

The notes below summarize the key methods and assumptions used to determine the ADC for FYE 2018.

Notes to Schedule

Valuation Date:	July 1, 2017
Timing:	Actuarially determined contributions are calculated based on the actuarial valuation at the beginning of the fiscal year.

Key Methods and Assumptions Used to Determine Contribution Rates

Actuarial Cost Method:	Entry Age Normal Cost Method
Asset Valuation Method:	4-year smoothed market
Amortization Method:	For ADC - Closed 30-year level percent of pay amortization of unfunded actuarial liability as of July 1, 2015
Discount Rate:	7.45%
Inflation:	2.50%
Salary Increases:	From 2.5% to 12.5% based on age
Mortality:	*Post-Retirement:* RP-2014 Annuitant Mortality Table with 50% of rates through age 69, 70% of rates between ages 70 and 79, 90% of rates between ages 80 and 84, and 100% of rates thereafter, projected forward generationally using mortality improvement scale MP-2016.
	Pre-Retirement: RP-2014 Employee Mortality Table, projected forward generationally using mortality improvement scale MP-2016.
	Post-Retirement Disabled: RP-2014 Disabled Mortality Table with 90% of rates for males and 100% of rates for females, projected forward generationally using mortality improvement scale MP-2016.

A complete description of the methods and assumptions used to determine contribution rates for the year ending June 30, 2018 can be found in the July 1, 2017 Actuarial Valuation Report.

SECTION VI – GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2018

GASB 68 Information

Employers that participate in the STRS were required to implement GASB 68 for their first fiscal year that commenced after June 15, 2014. The amounts reported as of their fiscal year end (their reporting date) must be based on a measurement date up to 12 months and one day prior to their reporting date. Therefore, the GASB 68 schedules in this section, which are based on a June 30, 2018 measurement date, can be used for employers' reporting up until fiscal years ending June 30, 2019.

Because STRS is a cost-sharing multiple-employer pension fund, each employer participating in STRS must reflect a portion of the collective net pension liability, pension expense, deferred outflows, and deferred inflows in their financial statements. This section develops the collective amounts that are based on the aggregate of the employers, which will then be allocated to participating employers.

The impact of experience gains or losses and assumption changes on the TPL are recognized in expense over the average expected remaining service life of all active and inactive members of STRS. As of the measurement date, this recognition period was five years. During the measurement year, there was an experience loss of $31.7 million.

The impact of investment gains or losses is recognized over a period of five years. During the measurement year, there was an investment gain of $1.5 billion.

SECTION VI – GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2018

The following table shows the detail related to the amounts of collective Deferred Outflows and Deferred Inflows for the current and prior years.

Table VI-5
Calculation of Deferred Items Schedule

Experience Year	Recognition Period	Total Amount	Remaining Years	Recognized in Pension Expense	Deferred Resources
Recognition of Experience (Gains) and Losses					
2018	5	$ 31,731,963	5	$ 6,346,393	$ 25,385,570
2017	5	(239,322,183)	4	(47,864,437)	$ (143,593,309)
2016	5	527,724,561	3	105,544,912	$ 211,089,825
2015	5	1,355,346,526	2	271,069,305	$ 271,069,306
2014	5	292,707,662	1	58,541,534	$ 0
Total		**$ 1,968,188,529**		**$ 393,637,707**	**$ 363,951,392**
Recognition of Assumption Changes					
2017	5	$ 6,494,407,977	4	$ 1,298,881,595	$ 3,896,644,787
Total		**$ 6,494,407,977**		**$ 1,298,881,595**	**$ 3,896,644,787**
Recognition of Investment (Gains) and Losses					
2018	5	$(1,457,979,231)	5	$ (291,595,846)	$(1,166,383,385)
2017	5	(4,180,129,249)	4	(836,025,850)	$(2,508,077,549)
2016	5	4,985,793,479	3	997,158,696	$ 1,994,317,391
2015	5	1,734,151,476	2	346,830,295	$ 346,830,296
2014	5	(5,624,915,576)	1	(1,124,983,116)	$ 0
Total		**$(4,543,079,101)**		**$ (908,615,821)**	**$(1,333,313,247)**

SECTION VI – GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2018

The table below summarizes the current balances of collective Deferred Outflows and Deferred Inflows of resources along with the net recognition over the next five years.

Table VI-6
Schedule of Deferred Inflows and Outflows of Resources

	Deferred Outflows of Resources	Deferred Inflows of Resources
Differences between expected and actual experience	$ 507,544,701	$ 143,593,309
Changes in assumptions	3,896,644,787	0
Net difference between projected and actual earnings on pension plan investments	-	1,333,313,247
Total	**$ 4,404,189,488**	**$ 1,476,906,556**

Amounts reported as deferred outflows and deferred inflows of resources will be recognized in pension expense as follows:

Measurement year ended June 30:	
2019	1,850,345,065
2020	1,232,445,463
2021	129,741,860
2022	(285,249,457)
2023	0
Thereafter	$ 0

SECTION VI – GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2018

The annual collective pension expense recognized by the participating employers can be calculated two different ways. First, it is the change in the amounts reported on the Statement of Net Position that relate to STRS and are not attributable to employer contributions. That is, it is the change in NPL plus the changes in deferred outflows and inflows plus employer contributions.

Alternatively, annual pension expense can be calculated by its individual components. While GASB does not require or suggest the organization of the individual components shown in the table below, we believe it helps to understand the level and volatility of pension expense.

Table VI-7
Calculation of Pension Expense

	Measurement Year Ending 2018	Measurement Year Ending 2017
Change in Net Pension Liability	$ (1,767,459,622)	$ (9,717,799,962)
Change in Deferred Outflows	1,708,651,777	(1,981,211,195)
Change in Deferred Inflows	501,498,973	975,407,583
Employer Contributions	1,634,027,228	1,590,868,100
Pension Expense	**$ 2,076,718,356**	**$ (9,132,735,474)**
Pension Expense as % of Payroll	**17.42%**	**-79.02%**
Operating Expenses		
Service cost	$ 1,075,333,908	$ 1,067,687,383
Employee contributions	(1,580,429,592)	(1,537,676,856)
Administrative expenses	63,306,680	63,652,306
Total	$ (441,789,004)	$ (406,337,167)
Financing Expenses		
Interest cost	$ 6,974,352,400	$ 7,611,942,025
Expected return on assets	(5,239,748,521)	(5,053,802,234)
Total	$ 1,734,603,879	$ 2,558,139,791
Changes		
Benefit changes	$ 0	$ (12,353,691,031)
Recognition of assumption changes	1,298,881,595	1,298,881,595
Recognition of liability gains and losses	393,637,707	387,291,312
Recognition of investment gains and losses	(908,615,821)	(617,019,974)
Total	$ 783,903,481	$ (11,284,538,098)
Pension Expense	**$ 2,076,718,356**	**$ (9,132,735,474)**

APPENDIX A – MEMBERSHIP INFORMATION

Table A-1
Ohio State Teachers - Member Status Reconciliation

	Actives	Reemployed Retirees	Inactive Eligible for Allowance	Inactive Eligible for Refunds Only	Retired	Disabled	Beneficiaries	Total
1. July 1, 2017 Valuation - Segal	168,132	25,009	18,403	139,533		140,944	17,095	509,116
July 1, 2017 Valuation - Cheiron Replication	**168,149**	**25,059**	**18,415**	**139,624**	**135,014**	**5,477**	**17,080**	**508,818**
2. Additions								
a. New Entrants	11,541	2,252	-	-	16	-	-	13,809
b. Total	11,541	2,252	-	-	16	-	-	13,809
3. Reductions								
a. Benefits Expired	-	-	-	-	(3)	-	(120)	(123)
b. Refunds	(2,294)	(5,227)	(933)	(7,694)	-	(58)	-	(16,206)
c. Deaths with no Beneficiaries	(49)	(58)	(10)	-	(1,829)	(40)	(847)	(2,833)
d. Total	(2,343)	(5,285)	(943)	(7,694)	(1,832)	(98)	(967)	(19,162)
4. Changes in Status								
a. Rehired	6,158	-	(1,359)	(4,791)	-	(8)	-	-
b. Inactive Eligible for Allowance	(2,648)	-	2,676	-	-	(28)	-	-
c. Inactive Eligible for Refunds Only	(8,387)	-	(13)	8,401	-	(1)	-	-
d. Retired	(2,014)	-	(400)	(3)	2,437	(20)	-	-
e. Reemployed Retiree	(6)	12	-	(6)	-	-	-	-
f. Disabled	(124)	-	(9)	-	-	133	-	-
g. Death with Beneficiaries	-	-	-	-	(1,022)	(164)	1,277	91
h. Plan Reselection	-	-	-	-	-	-	-	-
i. Data Corrections	1	-	49	2,544	105	23	-	2,722
j. Total	(7,020)	12	944	6,145	1,520	(65)	1,277	2,813
5. July 1, 2018 Valuation	**170,327**	**22,038**	**18,416**	**138,075**	**134,718**	**5,314**	**17,390**	**506,278**

APPENDIX A – MEMBERSHIP INFORMATION

Table A-2
Summary of Membership Data as of July 1, 2018 ($ in thousands)

		Male	Female	Total
1.	**Defined Benefit Plan Active Members**			
	Number of Members	46,246	117,692	163,938
	Annual Salaries (for period ending June 30, 2018)	$ 2,999,599	$ 6,881,822	$ 9,881,421
	Average Age	44.72	43.54	43.87
	Average Service	12.69	12.68	12.68
2.	**Combined Plan Active Members**			
	Number of Members	1,384	5,005	6,389
	Annual Salaries (for period ending June 30, 2018)	$ 84,633	$ 271,250	$ 355,883
	Average Age	43.28	41.02	41.51
	Average Service	8.18	8.64	8.54
3.	**Total Defined Benefit and Combined Plan Active Members**			
	Number of Members	47,630	122,697	170,327
	Annual Salaries (for period ending June 30, 2018)	$ 3,084,232	$ 7,153,072	$ 10,237,304
	Average Age	44.68	43.43	43.78
	Average Service	12.56	12.52	12.53
4.	**Defined Benefit Inactive Members**			
	Eligible for Allowances	4,377	13,494	17,871
	Eligible for Refunds Only	49,555	87,799	137,354
	Total	53,932	101,293	155,225
5.	**Combined Benefit Inactive Members**			
	Eligible for Allowances	105	440	545
	Eligible for Refunds Only	449	1,235	1,684
	Total	554	1,675	2,229
6.	**Total Inactive Members**			
	Eligible for Allowances	4,482	13,934	18,416
	Eligible for Refunds Only	50,004	89,034	139,038
	Total	54,486	102,968	157,454

APPENDIX A – MEMBERSHIP INFORMATION

Table A-2
Summary of Membership Data as of July 1, 2018 (continued) ($ in thousands)

		Male	Female	Total
7.	**Retirees**			
	Number of Members	44,865	89,853	134,718
	Annual Allowance	$ 2,406,774	$ 3,855,252	$ 6,262,026
	Average Allowance (in dollars)	$ 53,645	$ 42,906	$ 46,482
8.	**Disabled Retirees**			
	Number of Members	1,637	3,677	5,314
	Annual Allowance	$ 68,608	$ 133,358	$ 201,966
	Average Allowance (in dollars)	$ 41,911	$ 36,268	$ 38,006
9.	**Beneficiaries Receiving Optional Allowances**			
	Number of Members	3,168	8,318	11,486
	Annual Allowance	$ 72,486	$ 289,232	$ 361,718
	Average Allowance (in dollars)	$ 22,881	$ 34,772	$ 31,492
10.	**Survivors' Benefit Fund Beneficiaries**			
	Number of Members	2,686	3,218	5,904
	Annual Allowance	$ 48,442	$ 75,270	$ 123,712
	Average Allowance (in dollars)	$ 18,035	$ 23,390	$ 20,954
11.	**Total Retirees and Beneficiaries**			
	Number of Members	52,356	105,066	157,422
	Annual Allowance	$ 2,596,310	$ 4,353,112	$ 6,949,422
	Average Allowance (in dollars)	$ 49,590	$ 41,432	$ 44,145

APPENDIX A – MEMBERSHIP INFORMATION

Table A-3
Schedule of Valuation Data - Active Members

Valuation Date July 1,	Number of Active Members	Annualized Salaries*	Annual Average Pay	% Increase in Average Pay
2018	170,327	$ 10,581,345	$ 62,124	6.12%
2017	168,132	$ 9,842,388	$ 58,540	3.59%
2016	169,212	$ 9,562,236	$ 56,510	2.90%
2015	164,925	$ 9,057,095	$ 54,916	1.62%
2014	169,295	$ 9,148,438	$ 54,038	0.72%
2013	169,945	$ 9,118,036	$ 53,653	-0.50%
2012	173,044	$ 9,330,845	$ 53,922	-0.18%
2011	177,897	$ 9,609,723	$ 54,018	-1.40%
2010	175,842	$ 9,633,354	$ 54,784	0.78%
2009	174,807	$ 9,502,701	$ 54,361	2.55%

*In thousands.

Table A-4
Schedule of Valuation Data - Retirees/Beneficiaries

Fiscal Year Ended June 30,	Number of Benefit Recipients	Annual Allowances (in thousands)	Annual Average Allowances	% Increase in Annual Allowances
2018	157,422	$ 6,949,422	$ 44,145	-0.1%
2017	158,039	$ 6,955,309	$ 44,010	0.9%
2016	157,938	$ 6,896,162	$ 43,664	1.4%
2015	158,116	$ 6,801,181	$ 43,014	6.3%
2014	152,208	$ 6,397,535	$ 42,032	3.3%
2013	149,221	$ 6,190,182	$ 41,483	6.4%
2012	143,256	$ 5,815,407	$ 40,595	7.8%
2011	138,088	$ 5,393,372	$ 39,057	8.8%
2010	133,103	$ 4,957,960	$ 37,249	5.3%
2009	129,659	$ 4,706,964	$ 36,303	6.5%

APPENDIX A – MEMBERSHIP INFORMATION

Table A-5
Schedule of Valuation Data - Retirees/Beneficiaries

Fiscal Year Ended June 30,	Beginning Number of Benefit Recipients	Beginning Annual Allowances	Benefit Recipients Added	Payments Added	Benefit Recipients Removed	Payments Removed	Ending Number of Benefit Recipients	Ending Annual Allowance
2018	158,039	$ 6,955,309	3,847	$ 128,494	4,464	$ 134,381	157,422	$ 6,949,422
2017	157,938	$ 6,896,162	3,254	$ 155,702	3,153	$ 96,555	158,039	$ 6,955,309
2016	158,116	$ 6,801,181	2,675	$ 177,665	2,853	$ 82,684	157,938	$ 6,896,162
2015	152,208	$ 6,397,535	9,027	$ 490,598	3,119	$ 86,952	158,116	$ 6,801,181
2014	149,221	$ 6,190,182	5,550	$ 283,768	2,563	$ 76,415	152,208	$ 6,397,535
2013	143,256	$ 5,815,407	8,493	$ 441,942	2,528	$ 67,167	149,221	$ 6,190,182
2012	138,088	$ 5,393,372	8,761	$ 512,952	3,593	$ 90,917	143,256	$ 5,815,407
2011	133,103	$ 4,957,960	7,744	$ 501,900	2,759	$ 66,488	138,088	$ 5,393,372
2010	129,659	$ 4,706,964	7,089	$ 334,654	3,645	$ 83,658	133,103	$ 4,957,960
2009	126,506	$ 4,418,799	6,675	$ 366,645	3,522	$ 78,480	129,659	$ 4,706,964

APPENDIX A – MEMBERSHIP INFORMATION

Table A-6
Benefit Payments by Type as of July 1, 2018

Age Last Birthday	Number		Annual Allowance (in thousands)		Average Annual Allowance
Retirees					
Under 60	6,219	$	309,448	$	49,758
60-64	17,210		861,108		50,035
65-69	35,045		1,740,848		49,675
70-74	30,767		1,511,102		49,114
75-79	20,227		914,370		45,205
Over 79	25,250		925,150		36,640
Total	**134,718**	**$**	**6,262,026**	**$**	**46,482**
Disabled Retirees					
Under 60	1,200	$	44,127	$	36,773
60-64	761		29,226		38,405
65-69	1,049		43,941		41,888
70-74	983		40,289		40,986
75-79	618		23,079		37,345
Over 79	703		21,303		30,303
Total	**5,314**	**$**	**201,965**	**$**	**38,006**
Beneficiaries Receiving Optional Allowances					
Under 60	36	$	1,450	$	40,278
60-64	166		6,805		40,994
65-69	707		30,709		43,436
70-74	1,283		52,453		40,883
75-79	1,670		61,701		36,947
Over 79	7,624		208,601		27,361
Total	**11,486**	**$**	**361,719**	**$**	**31,492**
Survivors' Benefit Fund Beneficiaries					
Under 60	1,333	$	15,944	$	11,961
60-64	462		10,458		22,636
65-69	880		22,370		25,420
70-74	886		22,298		25,167
75-79	743		17,946		24,153
Over 79	1,600		34,696		21,685
Total	**5,904**	**$**	**123,712**	**$**	**20,954**
Grand Total	**157,422**	**$**	**6,949,422**	**$**	**44,145**

APPENDIX B – SUMMARY OF ASSUMPTIONS AND METHODS

A. Actuarial Assumptions

1. Mortality Rates

Post-Retirement: RP-2014 Annuitant Mortality Table with 50% of rates through age 69, 70% of rates between ages 70 and 79, 90% of rates between ages 80 and 84, and 100% of rates thereafter, projected forward generationally using mortality improvement scale MP-2016 (Adopted effective July 1, 2017).

Sample 2014 mortality rates are as follows:

Age	Male	Female
50	0.20%	0.14%
55	0.29%	0.18%
60	0.39%	0.26%
65	0.55%	0.40%
70	1.17%	0.90%
75	1.88%	1.47%
80	4.02%	3.14%
85	7.75%	6.05%
90	13.59%	10.71%
95	21.86%	17.90%
100	31.40%	27.09%

Pre-Retirement: RP-2014 Employee Mortality Table, projected forward generationally using mortality improvement scale MP-2016 (Adopted effective July1, 2017).

Post-Retirement Disabled: RP-2014 Disabled Mortality Table with 90% of rates for males and 100% of rates for females, projected forward generationally using mortality improvement scale MP-2016 (Adopted effective July 1, 2017).

Sample 2014 mortality rates are as follows:

Age	Male	Female
45	1.53%	0.90%
50	1.84%	1.19%
55	2.10%	1.45%
60	2.39%	1.70%
65	2.85%	2.09%
70	3.63%	2.82%
75	4.89%	4.10%

APPENDIX B – SUMMARY OF ASSUMPTIONS AND METHODS

2. Active Retirement Rates

The following rates of retirement are assumed for members eligible to retire (Adopted effective July 1, 2017).

Defined Benefit Plan – Grandfathered Male Rates				
Age	Under 25 Years of Service	25-29 Years of Service	30-34 Years of Service	35 or More Years of Service
<=52	0%	0%	20%	30%
53	0%	0%	20%	30%
54	0%	0%	20%	40%
55	0%	6%	20%	40%
56	0%	6%	20%	40%
57	0%	6%	20%	40%
58	0%	6%	20%	40%
59	0%	7%	20%	40%
60	10%	7%	20%	40%
61	10%	7%	20%	40%
62	12%	8%	20%	40%
63	12%	8%	25%	35%
64	12%	12%	25%	25%
65	20%	20%	25%	25%
66	20%	20%	25%	25%
67	15%	20%	25%	25%
68	15%	20%	25%	20%
69	15%	20%	25%	20%
70	15%	20%	25%	20%
71	15%	20%	25%	20%
72	15%	20%	25%	20%
73	15%	20%	25%	20%
74	15%	20%	25%	20%
75+	100%	100%	100%	100%

APPENDIX B – SUMMARY OF ASSUMPTIONS AND METHODS

Defined Benefit Plan – Grandfathered Female Rates				
Age	Under 25 Years of Service	25-29 Years of Service	30-34 Years of Service	35 or More Years of Service
<=52	0%	0%	20%	35%
53	0%	0%	20%	35%
54	0%	0%	20%	40%
55	0%	9%	20%	40%
56	0%	9%	20%	40%
57	0%	9%	20%	40%
58	0%	9%	20%	40%
59	0%	10%	25%	40%
60	10%	10%	30%	45%
61	10%	10%	30%	45%
62	10%	12%	30%	45%
63	10%	12%	35%	45%
64	15%	20%	35%	45%
65	25%	30%	35%	45%
66	20%	30%	35%	45%
67	20%	20%	35%	45%
68	20%	20%	35%	45%
69	20%	20%	35%	45%
70	20%	20%	35%	40%
71	20%	20%	35%	40%
72	20%	20%	35%	40%
73	20%	20%	35%	40%
74	20%	20%	35%	40%
75+	100%	100%	100%	100%

APPENDIX B – SUMMARY OF ASSUMPTIONS AND METHODS

Defined Benefit Plan – Non-grandfathered Male Rates				
Age	Under 25 Years of Service	25-29 Years of Service[1]	30-34 Years of Service[2]	35 or More Years of Service[2]
<=52	0%	3%	20%	20%
53	0%	3%	20%	20%
54	0%	3%	20%	20%
55	0%	3%	20%	20%
56	0%	3%	20%	20%
57	0%	3%	20%	20%
58	0%	3%	20%	20%
59	0%	5%	20%	20%
60	5%	5%	20%	25%
61	6%	6%	20%	25%
62	7%	7%	20%	25%
63	8%	8%	25%	25%
64	10%	10%	25%	25%
65	20%	20%	25%	25%
66	20%	20%	25%	25%
67	20%	20%	25%	25%
68	20%	20%	25%	20%
69	20%	20%	25%	20%
70	20%	20%	25%	20%
71	20%	20%	25%	20%
72	20%	20%	25%	20%
73	20%	20%	25%	20%
74	20%	20%	25%	20%
75+	100%	100%	100%	100%

[1] Rates prior to age 60 are zero if retirement eligibility requirements are not met.
[2] Use two times 25-29 Years of Service rates if not eligible for unreduced retirement (prior to age 65).

APPENDIX B – SUMMARY OF ASSUMPTIONS AND METHODS

Defined Benefit Plan – Non-grandfathered Female Rates				
Age	Under 25 Years of Service	25-29 Years of Service[1]	30-34 Years of Service[2]	35 or More Years of Service[2]
<=52	0%	5%	20%	20%
53	0%	5%	20%	20%
54	0%	5%	20%	20%
55	0%	5%	20%	20%
56	0%	5%	20%	20%
57	0%	5%	20%	20%
58	0%	5%	20%	20%
59	0%	5%	25%	25%
60	10%	10%	30%	30%
61	10%	10%	30%	30%
62	10%	10%	30%	30%
63	10%	10%	35%	35%
64	15%	15%	35%	35%
65	30%	30%	35%	35%
66	30%	30%	35%	35%
67	20%	20%	35%	35%
68	20%	20%	35%	35%
69	20%	20%	35%	35%
70	20%	20%	35%	30%
71	20%	20%	35%	30%
72	20%	20%	35%	30%
73	20%	20%	35%	30%
74	20%	20%	35%	30%
75+	100%	100%	100%	100%

[1] Rates prior to age 60 are zero if retirement eligibility requirements are not met.
[2] Use two times 25-29 Years of Service rates if not eligible for unreduced retirement (prior to age 65).

APPENDIX B – SUMMARY OF ASSUMPTIONS AND METHODS

Combined Plan		
Age	Male	Female
60	13%	22%
61	7%	9%
62	7%	9%
63	7%	9%
64	9%	15%
65	17%	20%
66	15%	13%
67	12%	13%
68	12%	12%
69	12%	12%
70	12%	12%
71	12%	12%
72	12%	12%
73	12%	12%
74	12%	12%
75	100%	100%

3. Inactive Vested Retirement Rates

5% at each early retirement age through age 64 and 100% at age 65, or the first age at which unreduced benefits are available.

4. Disability Rates

Select rates are shown below (Adopted effective July 1, 2017):

Age	Unisex Rates
Under 30	0.01%
30	0.01%
35	0.03%
40	0.05%
45	0.10%
50	0.18%
55	0.22%
60	0.25%
65 and Over	0.25%

APPENDIX B – SUMMARY OF ASSUMPTIONS AND METHODS

5. Termination Rates

Termination rates based on service, for causes other than death, disability, or retirement (Adopted effective July 1, 2017).

Vested Terminations*		
Age	**Male**	**Female**
20	11.25%	13.25%
25	11.25%	12.50%
30	2.75%	3.75%
35	2.00%	2.00%
40	1.75%	1.50%
45	1.75%	1.25%
50	2.00%	1.75%
55	3.25%	3.00%
60	0.00%	0.00%

*Termination rates stop at first retirement eligibility.

Non-Vested Terminations		
Service	**Male**	**Female**
Under 1 Year	30.00%	25.00%
1 to 2 Years	20.00%	20.00%
2 to 3 Years	15.00%	10.00%
3 to 5 Years	10.00%	10.00%

6. Percent Electing a Deferred Termination Benefit

50% of terminating members of the Defined Benefit Plan are assumed to elect a deferred termination benefit. The remaining 50% are assumed to take an immediate lump sum.

7. Percent Married:

For valuation purposes, 80% of male members and 60% of female members are assumed to be married. Male members are assumed to be three years older than their spouses, and female members are assumed to be one year younger than their spouses. (The assumed age difference adopted effective July 1, 2012 and reaffirmed effective July 1, 2017.)

8. Dependents for Survivor's Benefit

The spouse is the only assumed beneficiary for the survivor's benefit.

9. Missing Data

Where data was missing, the field was populated with the prior year's data, if available, or the average value of similar members.

APPENDIX B – SUMMARY OF ASSUMPTIONS AND METHODS

10. Investment Return Rate

7.45% per annum, compounded annually and net of all expenses.

11. Salary Increase Rates

Inflation rate of 2.50% plus merit and seniority increase, as shown below for selected ages (Adopted effective July 1, 2017).

Age	Rate
20	12.50%
25	11.50%
30	7.75%
35	6.50%
40	5.25%
45	4.75%
50	4.00%
55	3.50%
60	2.75%
65	2.50%

12. Payroll Growth Rates

3.00% per annum (Adopted effective July 1, 2017).

13. Defined Contribution Plan

The defined benefit account balance is added to the actuarial liability and the actuarial value of assets. If a member retires and elects to have the defined contribution account balance paid as an annuity, then the account balance is transferred to the Defined Benefit Plan and the annuity is valued as part of the Defined Benefit Plan.

14. Rationale for Assumptions

The demographic actuarial assumptions were adopted by the Board based on recommendations from the prior actuary from an experience study covering plan experience for the period July 1, 2011 through June 30, 2016. Cheiron has reviewed this experience study dated March 3, 2017. While we consider these assumptions to be generally reasonable, we have not yet performed our own actuarial experience study. An experience study will be performed once a sufficient amount of recent data has been accumulated.

B. Actuarial Methods

1. Actuarial Value of Assets

The actuarial value of assets is based on the market value of assets with a four-year phase-in of actual investment return in excess of (or less than) expected investment income. Expected investment income is determined using the assumed investment return rate and the actuarial value of assets (adjusted for receipts and disbursements during the year). The actual investment return for this purpose is determined net of all investment and administrative expenses. The actuarial value is further adjusted, if necessary, to be within 9% of the market value.

2. Actuarial Funding Method

The funding method for the valuation of liabilities used for this valuation is the Entry Age Normal (EAN) method. Under this funding method, a normal cost rate is determined as a level percentage of pay for each active participant. The normal cost rate multiplied by payroll equals the total normal cost for each participant. The normal cost contributions (Employer and Participant) will pay for projected benefits at retirement for each active participant.

The actuarial liability is the difference between the present value of future benefits and the present value of future normal costs. The difference between this actuarial liability and the actuarial value of assets is the unfunded actuarial liability (UAL).

The portion of the actuarial liability in excess of plan assets, the UAL, is amortized to develop an additional cost that is added to each year's employer normal cost. Under this funding method, actuarial gains and losses are directly reflected in the size of the unfunded actuarial liability. The amortization method is described below.

3. Amortization Method

The actuarially determined contribution (ADC) is determined as the sum of (a) the employer normal cost rate, and (b) a level percentage of payroll required to amortize the unfunded actuarial accrued liability over the 30-year closed period that began July 1, 2015.

APPENDIX C – SUMMARY OF PLAN PROVISIONS

Defined Benefit Plan

1. Eligibility for Membership

Immediate upon commencement of employment.

2. Service Retirement

Eligibility: Age 65 with five years of service, or age 55 with 25 years of service, or 30 years of service regardless of age. Age and service requirements increased effective August 1, 2015.

Effective August 1, 2015, service credit requirements for retirement with an unreduced benefit increased as follows:

Unreduced Benefit for Retirement Between:	Minimum Age and Years of Service
Through 7/1/2015	Any age and 30 years; or age 65 and 5 years
8/1/2015−7/1/2017	Any age and 31 years; or age 65 and 5 years
8/1/2017−7/1/2019	Any age and 32 years; or age 65 and 5 years
8/1/2019−7/1/2021	Any age and 33 years; or age 65 and 5 years
8/1/2021−7/1/2023	Any age and 34 years; or age 65 and 5 years
8/1/2023−7/1/2026	Any age and 35 years; or age 65 and 5 years
8/1/2026 and later	Age 60 and 35 years; or age 65 and 5 years

Amount: For members eligible to retire on or before July 1, 2015 (i.e. age 60 with 5 years of service, age 55 with 25 years of service, or 30 years of service regardless of age), the annual amount is equal to the greater of (a) 2.2% of final average salary for the three highest years of earnings, multiplied by years of total Ohio service credit, or 2.5% of final average salary for the three highest years of earnings if the member has 35 or more years of service credit, multiplied by years of total Ohio service credit up to 30 years of service. For years of Ohio contributing service credit in excess of 30 years, the following percentages will apply:

APPENDIX C – SUMMARY OF PLAN PROVISIONS

Year	Percentage
31	2.5%
32	2.6
33	2.7
34	2.8
35	2.9
36	3.0
37	3.1
38	3.2
39	3.3

or (b) $86 multiplied by years of service credit.

Effective August 1, 2015, the annual amount is equal to 2.2% of final average salary for the five highest years of earnings, multiplied by all years of service.

For members who were eligible to retire on July 1, 2015, the annual amount is greater of:

a. the benefit amount calculated upon retirement under the new benefit formula, or
b. the benefit amount the member would have received if he/she retired on July 1, 2015.

Annual salary is subject to the limit under IRC Section 401(a)(17).

For retirements prior to August 1, 2015, if the member has less than 30 years of service at retirement and is younger than age 65, the following reduction factors apply:

Attained Age	or	Years of Ohio Service Credit	% of Base Amount
58		25	75%
59		26	80
60		27	85
61			88
		28	90
62			91
63			94
		29	95
64			97
65		30 or more	100

APPENDIX C – SUMMARY OF PLAN PROVISIONS

For retirements on or after August 1, 2015, the age and service credit requirements for an actuarially reduced benefit are as follows:

Actuarially Reduced Benefit for Retirement Between:	Minimum Age and Years of Service
Through 7/1/2015	Age 55 and 25 years; or age 60 and 5 years
8/1/2015−7/1/2017	Any age and 30 years; or age 55 and 26 years; or age 60 and 5 years
8/1/2017−7/1/2019	Any age and 30 years; or age 55 and 27 years; or age 60 and 5 years
8/1/2019−7/1/2021	Any age and 30 years; or age 55 and 28 years; or age 60 and 5 years
8/1/2021−7/1/2023	Any age and 30 years; or age 55 and 29 years; or age 60 and 5 years
8/1/2023 and later	Any age and 30 years; or age 60 and 5 years

The actuarially reduced benefit reflects a reduction for each year that the member retirees before meeting eligibility for an unreduced benefit.

The benefits as a percentage of final average salary, which reflect the early retirement reduction, are shown in the booklet entitled *Service Retirement and Plans of Payment for members enrolled in the Defined Benefit Plan 2017/2018.*

3. Disability Retirement

Eligibility: Membership before July 30, 1992, and election of this benefit, completion of five or more years of service, under age 60 and permanently incapacitated for the performance of duty.

Amount:

1. Annuity with a reserve equal to the member's accumulated contributions, plus
2. The difference between (1) and the greater of 2% of the average salary during the three highest years of earnings times total service plus years and months from date of disability to age 60. Maximum allowance is 75% of final average salary. Minimum allowance is 30% of final average salary.

APPENDIX C – SUMMARY OF PLAN PROVISIONS

4. Disability Allowance

Eligibility: Membership after July 29, 1992, or membership before July 30, 1992 and election of this benefit, completion of five or more years of qualifying service and permanently incapacitated for the performance of duty. For membership on and after July 1, 2013, completion of ten years of qualifying service and permanently incapacitated for the performance of duty.

Amount: The greater of 2.2% of the average salary times total service. Maximum allowance is 60% of final average salary. Minimum allowance is 45% of final average salary. The disability allowance payment terminates at age 65 (or later if payment begins after age 60). After termination of the disability allowance, the member may apply for service retirement.

5. Death after Retirement

Lump-sum payment of $1,000 upon death after service or disability retirement.

6. Survivor's Benefit

Eligibility: Upon death after at least 1½ years of service credit for Ohio service with at least 1/4 year of such service in the 2½ years preceding death or upon death of a disability retiree. For membership on or after July 1, 2013, upon death after at least five years of service credit for Ohio service and died not later than one year after the date service terminated.

Qualified survivors will receive the highest benefit from among the following for which they are eligible: dependent-based benefit, service-based benefit, and retirement-based benefit.

Qualified beneficiaries are the spouse, dependent children, and/or dependent parents over age 65.

Dependent-based benefit: Monthly survivor benefits are determined according to the number of qualified survivors. These benefits are payable as a percentage of final average salary. The percentages are as follows:

Number of Qualified Dependents	% of Final Average Salary
1	25%
2	40
3	50
4	55
5 or more	60

APPENDIX C – SUMMARY OF PLAN PROVISIONS

Service – based benefit: If a member has 20 or more years of service before death, monthly survivor benefits are determined according to the number of years of service credit. These benefits are payable as a percentage of final average salary. The percentages are as follows:

Years of Service	% of Final Average Salary
20	29%
21	33
22	37
23	41
24	45
25	48
26	51
27	54
28	57
29 or more	60

Retirement–based benefit: If a member dies after meeting service retirement eligibility, the monthly survivor benefit is determined as if the member had actually retired and provided a 100% joint and survivor benefit to the qualified survivor. Early retirement reduction applies if the member is not eligible for unreduced benefit.

The primary beneficiary may withdraw the deceased member's account in lieu of receiving monthly benefits if there are no children who are qualified survivors.

7. Lump - Sum Withdrawal Option

In lieu of any other pension or survivor benefits, a member who leaves the System can receive his/her member contributions with interest in a lump-sum according to the following schedule:

Credit Service	Lump-Sum
Less than 3 Years	Member Contributions with 2% Interest
3 or More Years and Less than 5 Years	Member Contributions with 3% Interest
5 Years or More	150% of Member Contributions with 3% Interest

The Board has the authority to modify the interest credited to member contributions.

APPENDIX C – SUMMARY OF PLAN PROVISIONS

8. Plans of Payments

Benefits can be paid under the following forms of payment:

- Single life annuity
- Joint and survivor annuity -100%, 50% or other; with or without pop-up; with one or multiple beneficiaries
- Annuity certain
- Partial lump sum option – from six to 36 times the monthly single life annuity as a lump sum with the remainder as an annuity

9. Cost-of-Living Benefits

The basic benefit is increased each year by 2% of the original COLA. For members retiring on or after August 1, 2013, the 2% COLA is paid on the fifth anniversary of the retirement benefit. Future annual increases are calculated on the original benefit and are not compounded.

Effective July 2017, the COLA has been reduced to zero.

10. Contributions

By Members:	14% of salary.
By Employers:	14% of salaries of their employees who are members.
Rehired retirees:	Rehired retirees who return to employment after retirement and their employers both contribute to the System. These contributions fund an additional benefit payable after termination of employment. The contributions and interest are paid as a lump sum or converted to an additional annuity.

APPENDIX C – SUMMARY OF PLAN PROVISIONS

Combined Plan

1. Eligibility for Membership

New members hired on or after July 1, 2001 may elect in writing to participate in the Combined Plan.

2. Service (Normal) Retirement

Eligibility:	Age 60 with five years of service.
Amount:	The balance in the member's defined contribution account plus an annual amount equal to 1% of final average salary for the three highest paid years multiplied by years of total Ohio service credit. Effective August 1, 2015, final average salary will be average of the member's five highest salary years. Annual salary is subject to the limit under IRC Section 401(a)(17).

3. Early Retirement

Eligibility:	Before age 60 with five years of service
Amount:	The normal retirement benefit commencing at age 60. At age 50 or later, a member who elects to withdraw the full value of the member's defined contribution account may receive the withdrawal value of the formula benefit in a single sum, or leave the formula benefit on account for a benefit payable at age 60.

4. Vesting

Eligibility:	Completion of five years of service credit for the defined benefit portion. Member contributions and earnings are 100% vested at all times.
Amount:	A member who terminates with five or more years of service credit can receive the actuarial equivalent present value of the defined benefit formula. Prior to age 50, a withdrawal must include both the defined benefit and defined contribution portions of the account.

5. Late Retirement

Eligibility: After age 60 with five years of service.

Amount: The formula benefit described in the normal retirement section based on service credit and final average salary at termination without any actuarial adjustments.

6. Disability Allowance

Eligibility: Completion of five or more years of service and permanently incapacitated for the performance of duty. For membership on or after July 1, 2013, completion of ten years of qualifying service credit with STRS Ohio.

Amount: Members have the option of receiving disability benefits under the disability allowance program of the Defined Benefit Plan. All contributions and investment gains in the member's defined contribution account are used to fund the benefit. At age 65, the disability allowance converts to a service retirement benefit based on the 2.2% formula. Alternatively, the member can withdraw his/her defined contribution account in lieu of receiving the disability allowance.

7. Survivor's Benefit

Eligibility: Upon death after at least 1½ years of credit for Ohio service with at least 1/4 year of such service in the 2½ years preceding death or upon death of a disability retiree. For membership on or after July 1, 2013, upon death at least five years of qualifying service credit.

Amount: Qualified survivors have the option of receiving dependent-based, service-based, or retirement-based benefits described under the Defined Benefit Plan. Both employer contributions and the member's contributions and any investment gains in the member's defined contribution account are used to fund the benefit. Survivors also have the option to withdraw the defined contribution and defined benefit portions of the Combined Plan account in lieu of receiving a monthly benefit.

APPENDIX C – SUMMARY OF PLAN PROVISIONS

8. Forms of Payment of Defined Benefit Portion

If the member withdraws his/her defined contribution account prior to age 50, then the formula defined benefit must be paid in a lump sum. If the member is at least age 50, then the benefit can be paid as a single life annuity, a joint and survivor annuity as described under the Defined Benefit Plan, or as a lump sum. All alternative forms of payment are the actuarially equivalent of the single life annuity benefit payable at age 60.

9. Forms of Payment of Member's Defined Contribution Account

If the member withdraws his/her defined contribution account prior to age 50, then the account must be paid in a lump sum. If the member is at least age 50, then the member can elect that the actuarial equivalent of the defined contribution account be paid as a single life annuity or a joint and survivor annuity as described under the Defined Benefit Plan.

10. Cost-of-Living Benefits

Not available on the service retirement benefit. For disability and survivor benefits, the basic benefit is increased by the increase in the Consumer Price Index each year, but not to exceed 2% of the original base benefit.
Effective July 2017, the COLA has been reduced to zero.

11. Contributions

By Members:	14% of salary. 12.0% of salary is deposited into the member's defined contribution account and 2.0% is applied to the defined benefit portion of the Combined Plan.
By Employers:	14% of salary is used to fund the defined benefit formula. In addition, 4.47% of salary of the Defined Contribution Plan and the Alternative Retirement Plan is used to fund the unfunded actuarial liability of the Defined Benefit Plan.

APPENDIX C – SUMMARY OF PLAN PROVISIONS

Defined Contribution Plan

1. Eligibility for Membership

New members hired on or after July 1, 2001 may elect in writing to participate in the Defined Contribution Plan.

2. Service (Normal) Retirement

Eligibility:	Termination after age 50.
Amount:	The balance in the member's defined contribution account.

3. Early Retirement

Eligibility:	Termination before age 50.
Amount:	The balance in the member's defined contribution account.

4. Vesting

Eligibility:	Members vest 20% per year in employer contributions and all gains and losses on those contributions. Member contributions and earnings are 100% vested immediately.
Amount:	The balance in the member's defined contribution account.

5. Disability Allowance

Eligibility:	Permanently incapacitated for the performance of duty and termination of employment.
Amount:	The balance in the member's defined contribution account. At age 50, other payment options are available, but employment must first be terminated.

6. Survivor's Benefit

Eligibility:	Upon death.
Amount:	The balance in the member's defined contribution account. A spouse may either continue to manage the member's defined contribution account or withdraw the account.

APPENDIX C – SUMMARY OF PLAN PROVISIONS

7. Optional Forms of Payment

The actuarial equivalent of the member's defined contribution account can be paid on or after age 50 as a single life annuity or as a joint and survivor annuity as described in the Defined Benefit Plan.

8. Cost-of-Living Benefits

Not available.

9. Contributions

By Members:	14% of salary is deposited into the member's defined contribution account.
By Employers:	Effective July 1, 2017, 9.53% of salary is deposited into the member's defined contribution account. 4.47% of salaries are used to amortize the unfunded actuarial liability of the defined benefit plan.

APPENDIX D – GLOSSARY OF TERMS

Funding

1. Actuarial Assumptions

Assumptions as to the occurrence of future events affecting pension costs, such as: mortality, withdrawal, disability, and retirement; changes in compensation; inflation; rates of investment earnings, and asset appreciation or depreciation; and other relevant items.

2. Actuarial Cost Method

A procedure for determining the Actuarial Present Value of pension plan benefits and expenses and for developing an allocation of such value to each year of service, usually in the form of a Normal Cost and an Actuarial Liability.

3. Actuarial Gain/(Loss)

A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions during the period between two Actuarial Valuation dates, as determined in accordance with a particular Actuarial Cost Method.

4. Actuarial Liability

The portion of the Actuarial Present Value of Projected Benefits which will not be paid by future Normal Costs. It represents the value of the past Normal Costs with interest to the valuation date.

5. Actuarial Present Value (Present Value)

The value as of a given date of a future amount or series of payments. The Actuarial Present Value discounts the payments to the given date at the assumed investment return and includes the probability of the payment being made. As a simple example: assume you owe $100 to a friend one year from now. Also, assume there is a 1% probability of your friend dying over the next year, in which case you will not be obligated to pay him. If the assumed investment return is 10%, the actuarial present value is:

Amount		Probability of Payment		1/(1+Investment Return)		
$100	x	(1 - .01)	x	1/(1+.1)	=	$90

6. Actuarial Valuation

The determination, as of a specified date, of the Normal Cost, Actuarial Liability, Actuarial Value of Assets, and related Actuarial Present Values for a pension plan.

APPENDIX D – GLOSSARY OF TERMS

7. Actuarial Value of Assets

The value of cash, investments and other property belonging to a pension plan as used by the actuary for the purpose of an Actuarial Valuation. The purpose of an Actuarial Value of Assets is to smooth out fluctuations in market values. This way long-term costs are not distorted by short-term fluctuations in the market.

8. Actuarially Equivalent

Of equal Actuarial Present Value, determined as of a given date with each value based on the same set of Actuarial Assumptions.

9. Amortization Payment

The portion of the pension plan contribution which is designed to pay interest and principal on the Unfunded Actuarial Liability in order to pay for that liability in a given number of years.

10. Entry Age Normal Actuarial Cost Method

A method under which the Actuarial Present Value of the Projected Benefits of each individual included in an Actuarial Valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit ages.

11. Funded Percentage

The ratio of the Actuarial Value of Assets to the Actuarial Liabilities.

12. Investment Return Assumption

The assumed interest rate used for projecting dollar related values in the future.

13. Mortality Table

A set of percentages which estimate the probability of death at a particular point in time. Typically, the rates are annual and based on age and sex.

14. Normal Cost

That portion of the Actuarial Present Value of pension plan benefits and expenses, which is allocated to a valuation year by the Actuarial Cost Method.

APPENDIX D – GLOSSARY OF TERMS

15. Projected Benefits

Those pension plan benefit amounts which are expected to be paid in the future under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and increases in future compensation and service credits.

16. Unfunded Actuarial Liability

The excess of the Actuarial Liability over the Actuarial Value of Assets.

GASB

1. Actuarially Determined Contribution

A target or recommended contribution for the reporting period, determined in conformity with Actuarial Standards of Practice based on the most recent measurement available when the contribution for the reporting period was adopted.

2. Actuarial Valuation Date

The date as of which an actuarial valuation is performed. This date may be up to 24 months prior to the measurement date and up to 30 months prior to the employer's reporting date.

3. Deferred Inflow of Resources

An acquisition of net assets by a government employer that is applicable to a future reporting period. In the context of GASB 68, these are experience gains on the Total Pension Liability, assumption changes reducing the Total Pension Liability, or investment gains that are recognized in future reporting periods.

4. Deferred Outflow of Resources

A consumption of net assets by a government employer that is applicable to a future reporting period. In the context of GASB 68, these are experience losses on the Total Pension Liability, assumption changes increasing the Total Pension Liability, or investment losses that are recognized in future reporting periods.

5. Entry Age Actuarial Cost Method

The actuarial cost method required for GASB 67 and 68 calculations. Under this method, the actuarial present value of the projected benefits of each individual included in an actuarial valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit ages. The portion of this actuarial present value allocated to a valuation year is called the Service Cost. The portion of this actuarial present value not provided for at a valuation date by the actuarial present value of future service costs is called the Total Pension Liability.

APPENDIX D – GLOSSARY OF TERMS

6. Measurement Date

The date as of which the Total Pension Liability and Plan Fiduciary Net Position are measured. The Total Pension Liability may be projected from the Actuarial Valuation Date to the Measurement Date. The Measurement Date must be the same as the Reporting Date for the Plan.

7. Net Pension Liability

The liability of employers and nonemployer contributing entities for employees for benefits provided through a defined benefit pension plan. It is calculated as the Total Pension Liability less the Plan Fiduciary Net Position.

8. Plan Fiduciary Net Position

The fair or market value of assets.

9. Reporting Date

The last day of the plan or employer's fiscal year.

10. Service Cost

The portion of the actuarial present value of projected benefit payments that is attributed to the current period of employee service in conformity with the requirements of GASB 67 and 68. The Service Cost is the normal cost calculated under the entry age actuarial cost method.

11. Total Pension Liability

The portion of the actuarial present value of projected benefit payments that is attributed to past periods of employee service in conformity with the requirements of GASB 67 and 68. The Total Pension Liability is the actuarial liability calculated under the entry age actuarial cost method. This measurement generally is not appropriate for estimating the cost to settle the Plan's liabilities.