

State Teachers Retirement System of Ohio

Actuarial Valuation Report as of June 30, 2019

Produced by Cheiron

October 2019

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October 30, 2019

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 June 30, 2019 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.

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
 - o Schedule of Changes in Employers’ Net Pension Liability
 - o Schedule of Employers’ Net Pension Liability
 - o Schedule of Employers’ Contributions – Pension
 - o Notes to Required Supplementary Information – Pension
 - o Sensitivity of the Net Pension Liability to the Discount Rate Assumption
- Actuarial
 - o Schedule of Valuation Data – Active Members
 - o Schedule of Valuation Data – Retirees/Beneficiaries
 - o Benefit Recipients Added to and Removed from the Rolls
 - o Solvency Test
 - o Analysis of Financial Experience
- Statistical
 - o Actuarial Funded Ratio & Funding Period
 - o Selected Funding Information – Defined Benefit Plan
 - o Number of Benefit Recipients by Type
 - o Summary of Active Membership Data
 - o 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.

Members of the Board

October 30, 2019

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This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. 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.

Sincerely,
Cheiron



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



Michael Noble, FSA, FCA, MAAA, EA
Principal Consulting Actuary

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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,
- Identify, assess and disclose material risks 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 June 30, 2019 Actuarial Valuation is as follows:

- The Unfunded Actuarial Liability (UAL) decreased from \$23.8 billion as of June 30, 2018 to \$23.4 billion as of June 30, 2019.
- 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 16.6 years.
- The STRS funded ratio, the ratio of actuarial asset value over actuarial liabilities increased from 75.5% as of June 30, 2018 to 76.1% as of June 30, 2019.
- There was a net actuarial experience gain of \$38.3 million.
 - During the year ended June 30, 2019, the Plan’s assets earned 6.59% (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 7.46% (as compared to 7.45% assumed for the period ending June 30, 2019). This resulted in a slight actuarial gain on investments of \$3.5 million.
 - On the liability side, the plan experienced an actuarial experience gain of \$34.8 million.
- Given the Plan’s relatively high discount rate and negative cash flows (contributions less benefits and expenses) relative to Plan assets, as well as the Plan’s fixed statutory contribution rate, we do not recommend any change in Plan benefits at this time that would increase Plan liabilities without a corresponding increase in contributions to fully fund that benefit increase. Therefore, without an additional source of funding above the current fixed statutory rate, a continued reduction of the cost of living adjustment to zero remains necessary.

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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					
	June 30, 2019			June 30, 2018	% change
	Defined Benefit	Combined	Total	Total	
Counts					
Active Members					
(i) Defined Benefit	163,479	6,525	170,004	170,327	(0.19%)
(ii) Defined Contribution	9,846	-	9,846	9,682	1.69%
Reemployed Retirees	21,026	-	21,026	22,038	(4.59%)
Inactive Members					
(i) Eligible for Allowances	18,216	587	18,803	18,416	2.10%
(ii) Eligible for Refunds Only	138,095	1,326	139,421	138,075	0.97%
Retirees and Beneficiaries	157,133	285	157,418	157,422	(0.00%)
Total	507,795	8,723	516,518	515,960	0.11%
Total Payroll					
(i) Defined Benefit Plan Members	\$ 10,704,958,962	\$ 383,825,864	\$ 11,088,784,826	\$ 10,775,526,239	2.91%
(ii) Defined Contribution Plan Members	438,960,730	-	438,960,730	412,658,177	6.37%
(iii) Alternative Retirement Plan Members	769,054,683	-	769,054,683	735,503,706	4.56%
Total	\$ 11,912,974,375	\$ 383,825,864	\$ 12,296,800,239	\$ 11,923,688,122	3.13%
Annual Allowances	\$ 6,968,802,061	\$ 2,352,914	\$ 6,971,154,975	\$ 6,949,421,897	0.31%
Assets and Liabilities					
Actuarial Liability (AL) ¹	\$ 97,552,358,329	\$ 288,586,068	\$ 97,840,944,397	\$ 96,904,056,552	0.97%
Actuarial Value of Assets (AVA)			74,411,835,742	73,115,358,320	1.77%
Unfunded Actuarial Liability (UAL)			\$ 23,429,108,655	\$ 23,788,698,232	(1.51%)
Funded Ratio (AVA basis)			76.1%	75.5%	
Market Value of Assets (MVA)			\$ 75,726,545,352	\$ 74,916,301,830	1.08%
Funded Ratio (MVA basis)			77.4%	77.3%	
Funding Period			16.6 years	17.8 years	(6.38%)
Contribution Rates					
			Fiscal Year 2019	Fiscal Year 2018	
Normal Cost	10.83%	3.99%	10.58%	10.67%	(0.83%)
Member Contribution Rate	14.00%	2.00%	13.57%	13.58%	(0.11%)
Allocation of Employer Contribution Rate					
Employer Normal Cost	(3.17%)	1.99%	(2.98%)	(2.91%)	2.54%
Unfunded Actuarial Accrued Liability	17.17%	12.01%	16.98%	16.91%	0.44%
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%

¹Defined Benefit Actuarial Liability (AL) includes Defined Contribution Account Balances and prior Defined Contribution participants who have converted their account to an annuity.

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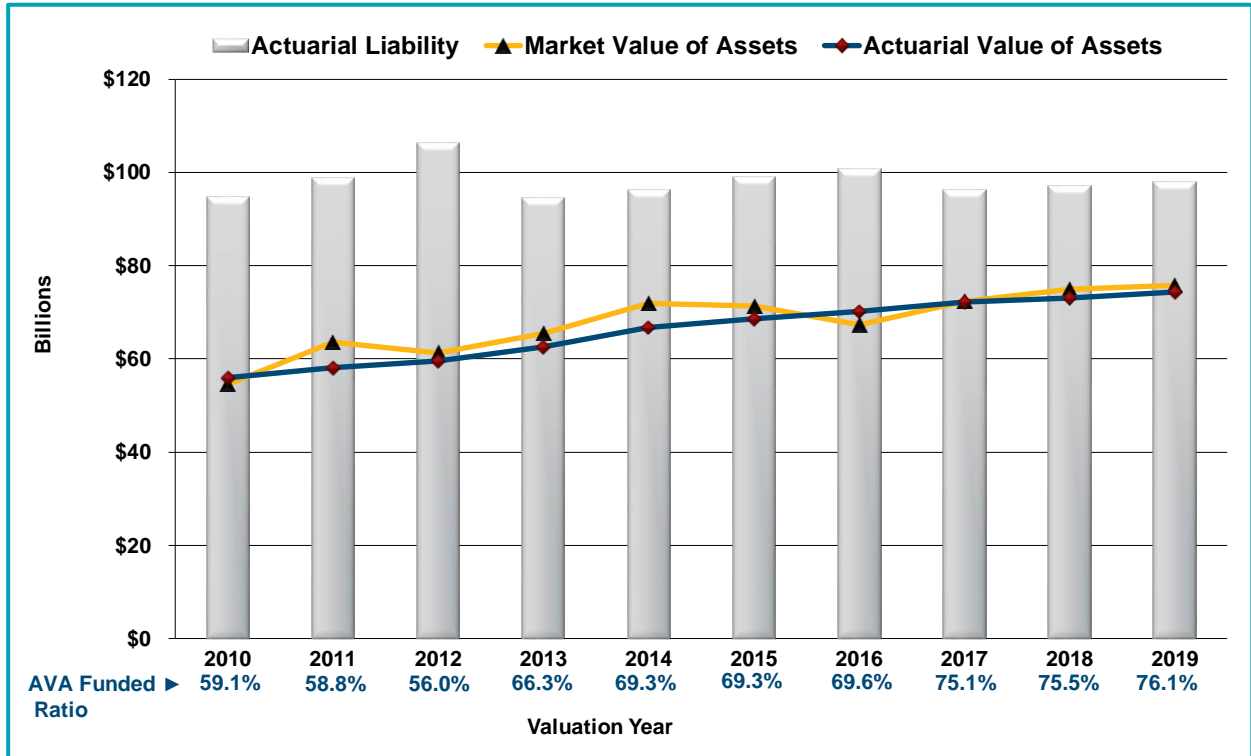
Historical Trends

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.

While the Plan’s funded ratio has been steadily increasing since 2013, it still remains well below the target funded ratio of 100%.



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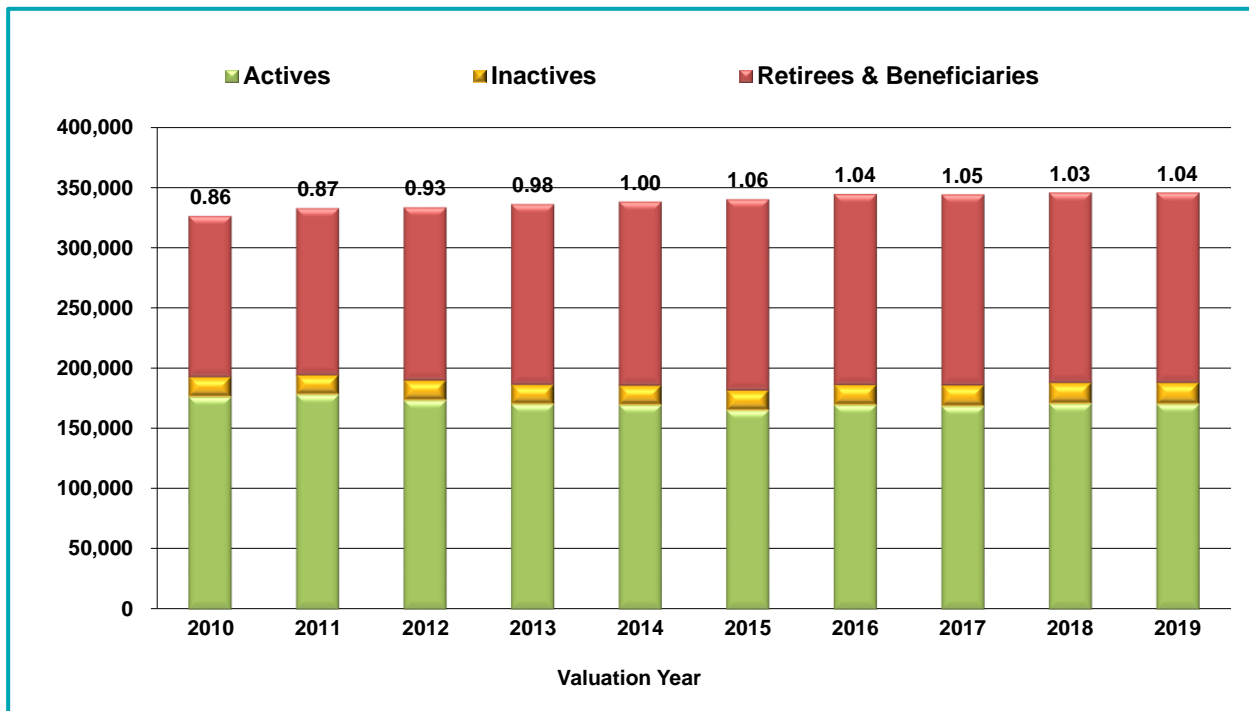
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Participant Trends

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 more retired and inactive members there are relative to active members, the more challenging it is for a plan to make up for experience losses (investment and liability) with contribution increases.

The support ratio has been generally increasing since 2010, which is common among mature systems.



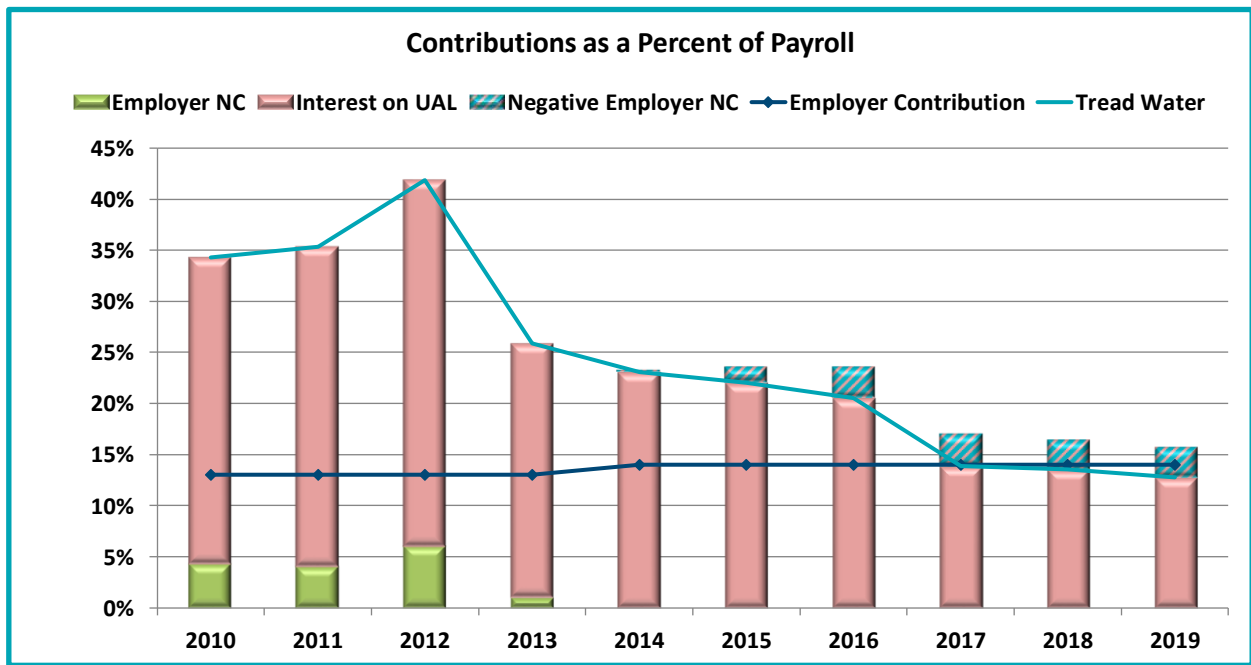
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Contributions versus “Tread Water”

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 in the following year if all experience exactly matched the assumptions. That happens when the full normal cost plus interest on the UAL is contributed.

As can be seen in the following chart, the fixed employer contribution rate for all years shown in the chart was well below the tread water rate prior to 2017. Then, starting in 2017, the fixed employer contribution rate has exceeded the tread water rate and the excess has continued to grow slightly the past two years. The negative employer normal cost shown in years 2014 through 2019 is due to member contributions exceeding the total normal cost, which is then used to partially pay for the interest on the UAL.

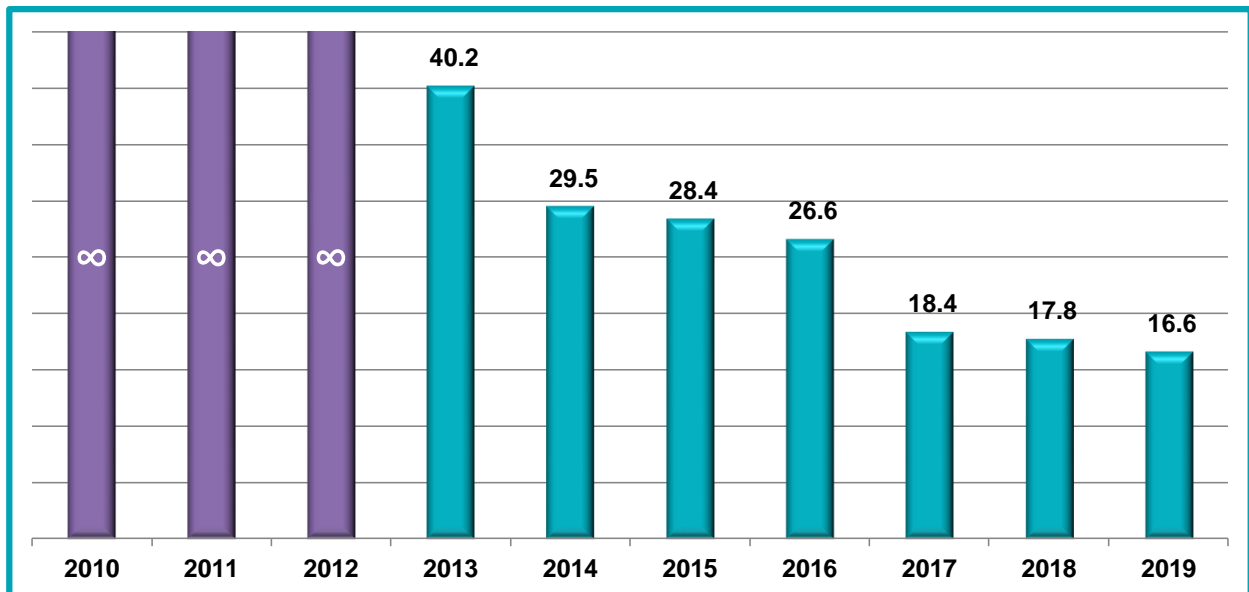


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Amortization Periods

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 2010 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 2019. 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.



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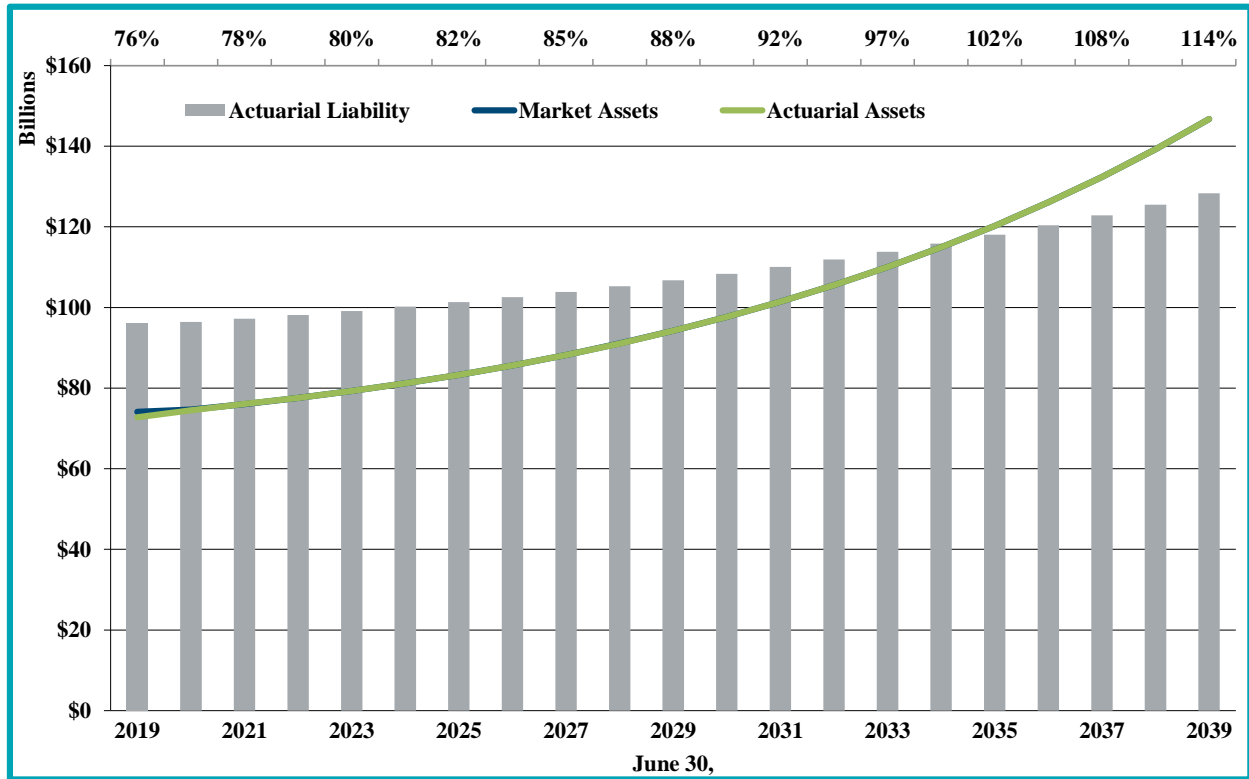
Future Expected Financial Trends

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 the System’s funding status over the next 20 years. Our baseline projection that follows is based on all results exactly matching assumptions, including that employers 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 June 30 of the labelled year.

The System’s funded ratio on an Actuarial Value of Assets basis, shown along the top of the chart, is projected to improve from the current level of 76% to 114% by the 2039 valuation.

This baseline projection assumes an annual return on the Market Value of Assets each year of 7.45% and the employer and employee contribution rates remain unchanged.



SECTION II – DISCLOSURES RELATED TO RISK

Introduction

Actuarial Standard of Practice (ASOP) No. 51 was recently published by the Actuarial Standards Board to provide guidance to actuaries on the assessment and disclosure of risks related to the possibility that future pension plan experience will deviate from assumptions. This standard does not introduce new concepts to actuarial work; it simply attempts to provide some codification of the practice. Our reports have routinely included stress testing of the valuation results showing the impact of future experience deviating from the underlying assumptions. However, with this ASOP becoming effective for this June 30, 2019 actuarial valuation report, we have taken this as an opportunity to consolidate the information regarding assessment and disclosure of the pension plan's risks in this section II as well as add a number of additional items helping to communicate and demonstrate these risks.

The pension plan's actuarial valuation results are dependent on assumptions about future economic and demographic experience. Based on actuarial standards of practice, the assumptions represent a reasonable estimate for future experience. However, actual experience will never conform exactly to the assumptions and may differ significantly from the assumptions. This deviation is the risk that pension plan sponsors undertake in relying on a pension plan's actuarial valuation results.

This section of this report is intended to identify the primary drivers of these risks, provide background information and assessments about these identified risks and communicate the significance of these risks to this plan.

Identification of Risks

For pension plans, the three primary valuation results that can significantly differ from those expected are in the assets, liabilities, and employer contributions. While there are several factors that could lead to these results being different, we believe the primary risks to this Plan are:

- Investment risk,
- Longevity and other demographic risks
- Plan change risk,
- Contribution risk
- Assumption change risk,

Other risks that we have not identified may also turn out to be important.

Investment Risk is the potential for investment returns to deviate from what is expected. When actual investment returns are lower than the investment assumption used in the actuarial valuation, the unfunded liability will increase and the period of time over which the unfunded liability is expected to be paid will increase. But, when actual returns exceed the assumption, the

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resulting unfunded liability measurements and resulting amortization period will be lower than anticipated.

Longevity and Other Demographic Risk is the potential for mortality or other demographic experience to be different than expected. Generally, longevity and other demographic risks emerge slowly over time as the actual experience deviates from expected. In addition, the extensive number of assumptions related to longevity and demographic experience often result in offsetting factors contributing to the Plan's overall liability experience. As such, these risks are often dwarfed by other risks, particularly those due to the investment returns. The charts on pages 10 and 11 show that this has been true for this Plan, with the magnitude of the gains and losses from liability experience significantly smaller than those from investment experience, assumption changes, and plan changes.

Plan Change Risk is the potential for the provisions of the Plan to be changed such that the funding or benefits are changed materially. In addition to the actual payments to and from the Plan being changed, future valuation measurements can also be impacted, with plan changes leading to deviations between actual future measurements and those expected by the current valuation.

Contribution risk is the potential for actual future contributions to deviate from expected future contributions, or that the anticipated contributions will be inadequate to fund the plan benefits. There are different sources of contribution risk ranging from the sponsor choosing to not make contributions in accordance with the funding policy to material changes in the contribution base (e.g., covered employees, covered payroll, sponsor revenue) that affect the amount of contributions the plan can collect.

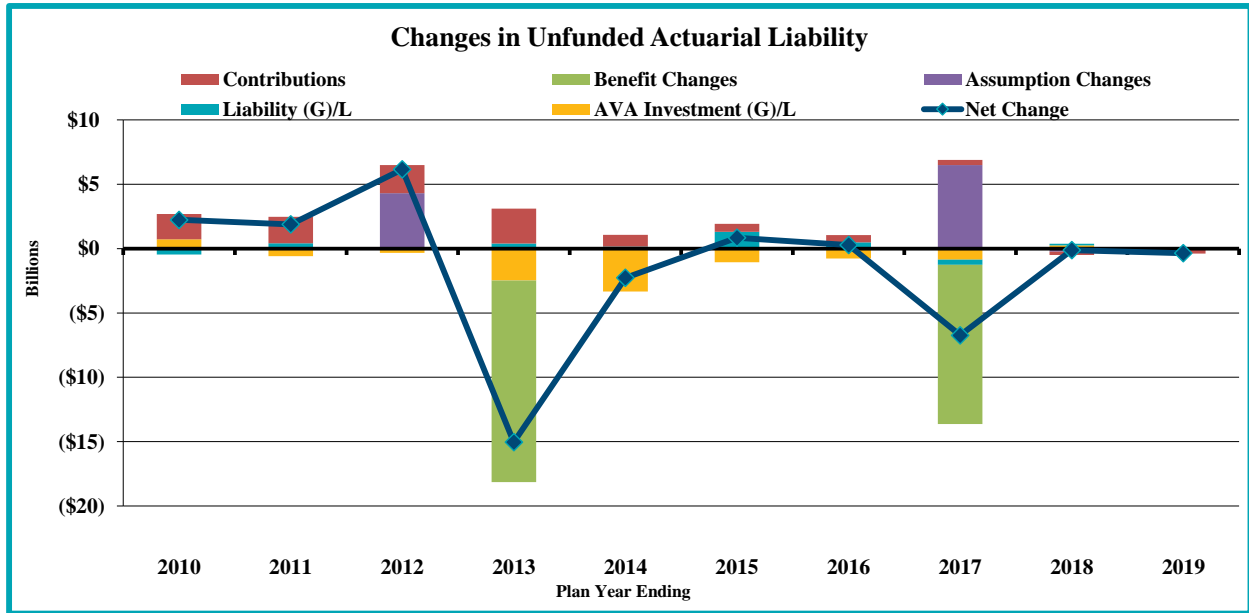
Assumption Change Risk is the potential for the environment to change such that future valuation assumptions are adjusted to be different than the current assumptions. For example, declines in interest rates over time may result in a change in the assumed rates of return used in the valuation. A healthier workforce may result in changes in employee behavior such that retirement rates are adjusted to reflect employees working longer. Assumption change risk is an extension of the risks previously identified, but rather than capturing the risk as it is experienced, it captures the cost of recognizing a change in the environment when the current assumption is no longer reasonable. The historical review section will show that assumption change risk has been a relatively significant risk for this Plan.

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Historical Review

In understanding the impact of some of these risks, it is useful to look at what factors contributed to the Plan’s Unfunded Actuarial Liability (UAL). These factors consist of annual actuarial experience gains and losses, assumption changes, plan changes, and contribution shortfalls or excesses. The following chart shows how these factors have contributed, at each valuation date, to the Plan’s UAL.

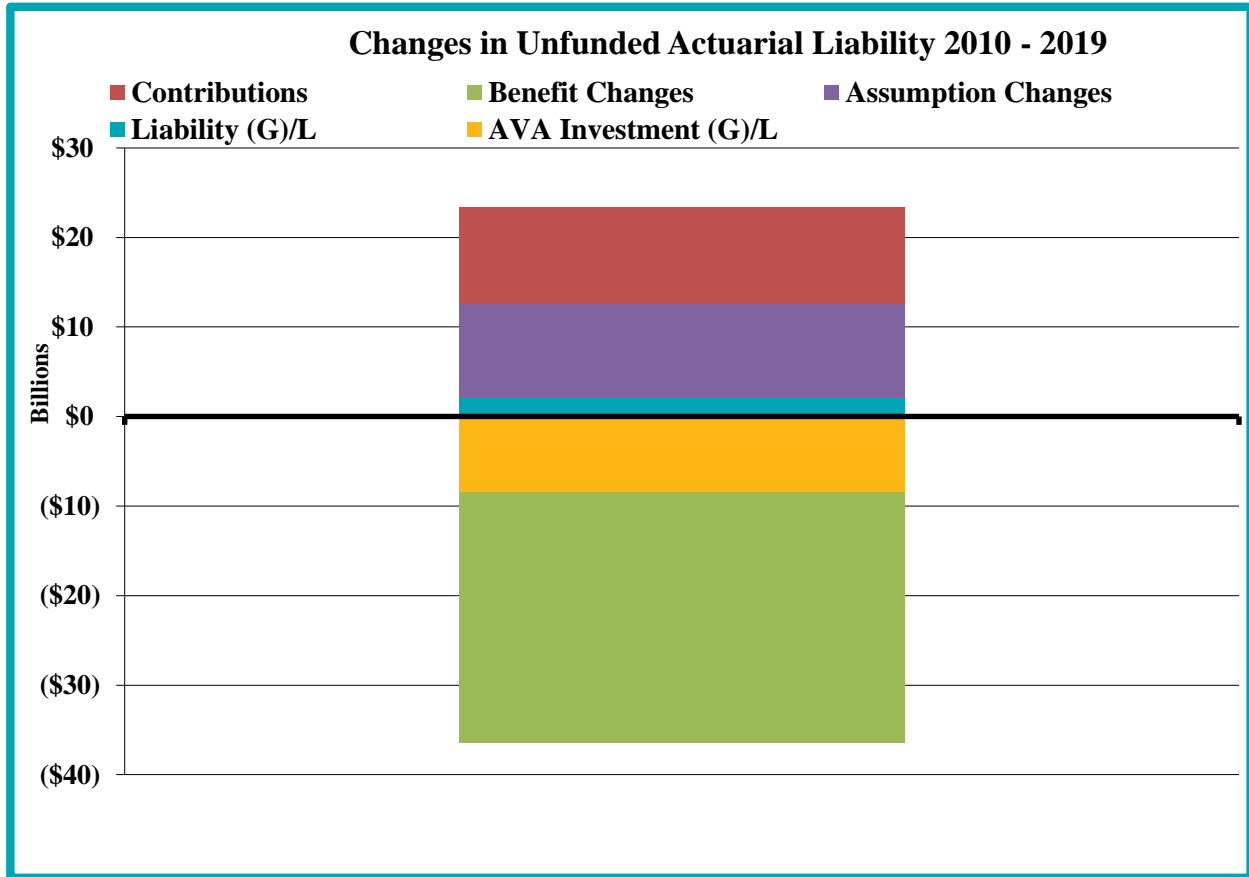


As described previously and is evident in this chart, plan changes and assumption changes have been the most significant factors contributing to the Plan’s UAL. The next two most significant factors are the investment gains and losses and the fixed contribution shortfalls or excesses.

Another way to examine how each of the factors contributed to the current UAL is to look at the cumulative impact of each factor. The next chart shows this impact over the past ten years.

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Over this period, plan changes and investment gains served to decrease the Unfunded Actuarial Liability by \$37 billion while contribution shortfalls, assumption changes, and very small liability net losses served to increase the Unfunded Actuarial Liability by \$22 billion.

Plan Maturity Measures

As pension plans become more mature, the identified risks become of more significant concern. As a result, it has become increasingly important to examine measures that indicate a pension plan’s maturity level.

The balance of this section discloses and examines three maturity measures: the asset leverage ratio, the support ratio, and the net cash flow ratio.

Asset Leverage Ratio

One of the more important plan maturity measures is the asset leverage ratio— the Market Value of Assets divided by the Plan’s payroll. As a plan matures, its assets increase. The greater the plan’s assets are relative to payroll, the more vulnerable the plan is to investment volatility. The following example demonstrates this.

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(\$ in millions)		
	Plan A	Plan B
Plan Assets	\$ 5,000	\$ 5,000
Payroll	\$500	\$1000
Asset Leverage Ratio	10.0	5.0
10% Investment Loss	\$500.0	\$500.0

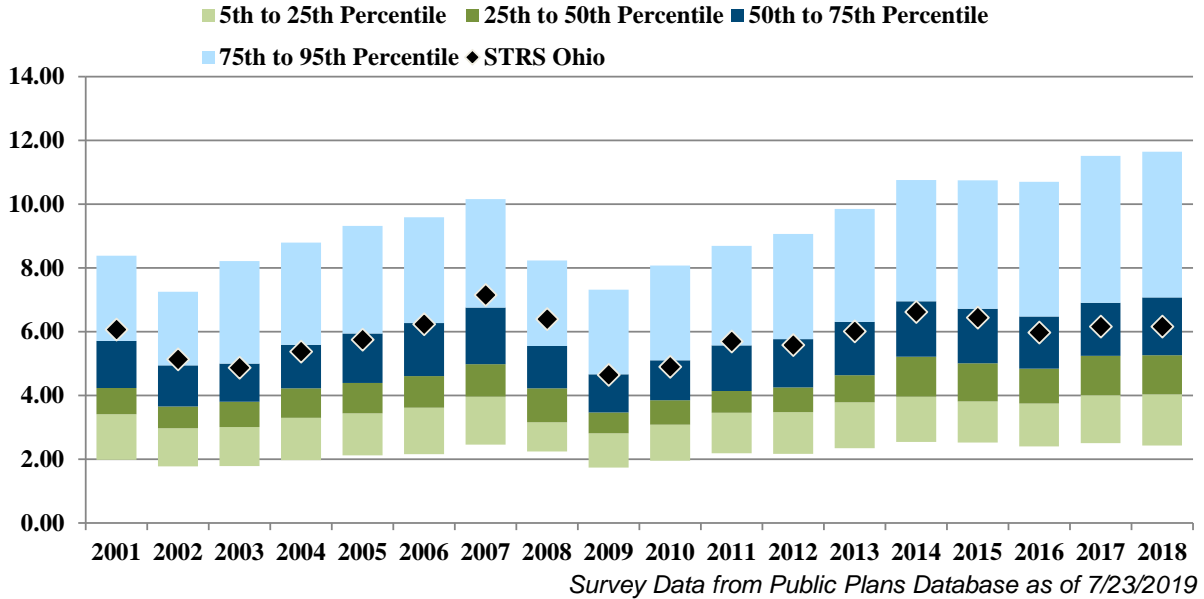
This example shows two plans that both experience a 10% investment loss equaling \$500 million. Although their assets are the same, because of the size of payroll Plan A’s asset leverage ratio is 10 and Plan B’s ratio is 5. This means that Plan A has to spread or amortize that loss over a payroll that is half as large as Plan B’s. To put it another way, other things being equal, Plan A would need to increase contributions as a percentage of payroll by twice the increase in contribution rate of Plan B in order to make up the same investment loss.

The Boston College’s Center for Retirement Research, NASRA and the Center for State and Local Government Excellence maintain the Public Plan Database that contains the majority of state plans as well as many large municipal plans. The following chart shows the asset leverage ratios for all 126 plans in this database since 2001. The colored bars represent the central 90% of the asset leverage ratios for the plans. STRS Ohio is represented by the black diamond. From 2001 through 2011, Ohio’s asset leverage ratio was close to the 75th percentile of all plans. Since 2011, Ohio’s asset leverage ratio has stayed steady around 6.0 putting the plan in just over the 60th percentile. This means that while STRS Ohio, by this measure, is more mature than 60 percent of all plans that is a slight improvement when compared to being more mature than 75 percent of all plans back in 2001.

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MVA Leverage Ratio



Another leverage ratio that can be examined is the Liability Leverage Ratio, the ratio of Actuarial Liabilities to payroll. Because liabilities have significantly less annual volatility or gains and losses than assets, this measure is less important.

Support Ratio

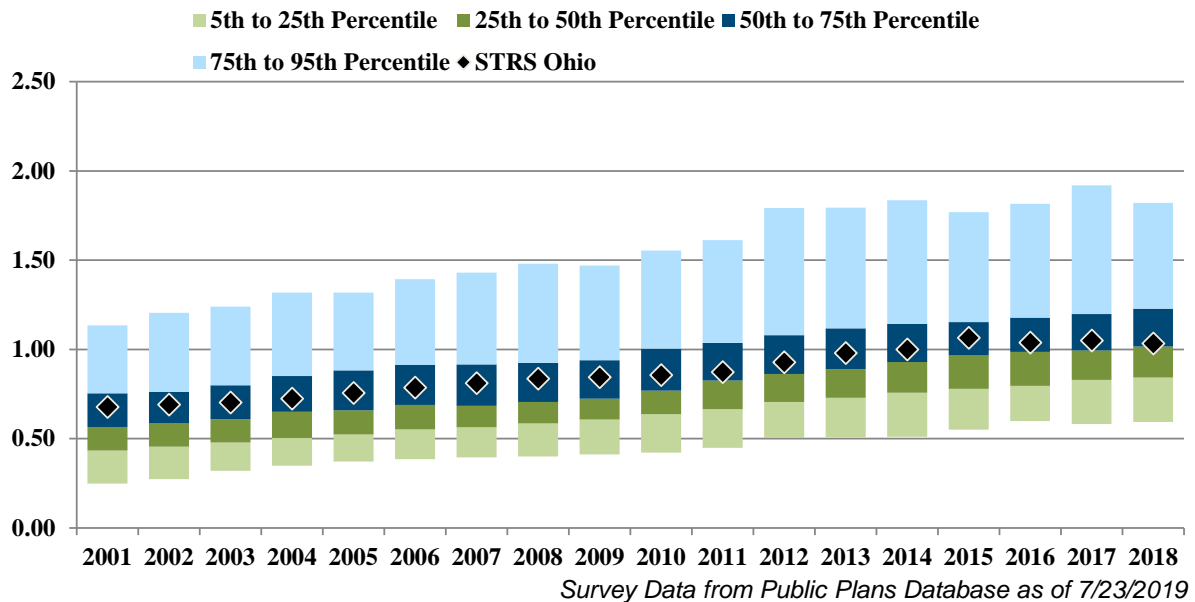
A commonly used measure of plan maturity is the Support Ratio, the ratio of retired and inactive members or those receiving benefits or entitled to a deferred benefit to the number of active members or those currently accruing benefits in the Plan. The greater this ratio, the more likely that the Plan will develop negative cash flow. The chart on page 4 shows that the support ratio for STRS Ohio has grown over the last 10 years.

The following chart shows the support ratio over time for the Plan compared to the Public Plan database.

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Support Ratio



The black diamonds in this chart shows that STRS Ohio’s support ratio for each year has generally increased over time and has gone from above the 60th percentile level to about the 50th percentile. This indicates that the Plan is maturing, as have most plans in this database over the years, and has done so at a slightly slower rate than the universe of plans.

Net Cash Flow Ratio

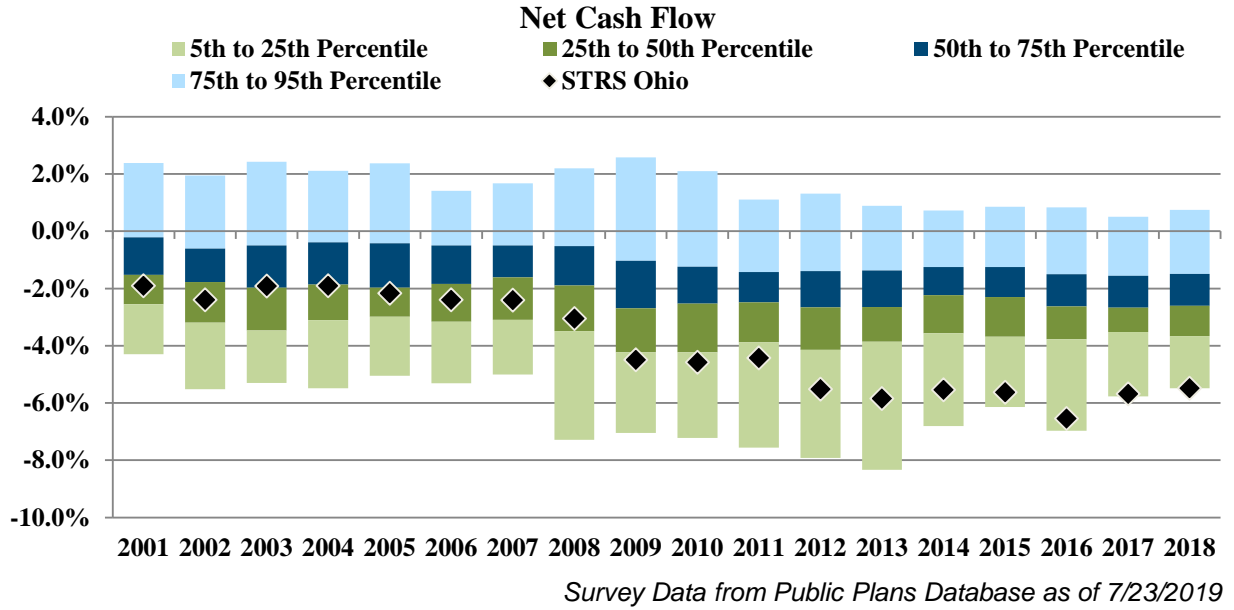
Another measure of plan maturity is the ratio of the net cash flow out of the Plan benefits and expenses less contributions, divided by the market value of plans assets. With shrinking workforces, aging Baby Boomers, and retirees living longer, plans pay out more in benefits than they receive in contributions, leading to negative net cash flows, excluding investment income.

When plans with negative net cash flows suffer investment losses, they need to liquidate enough assets to pay for benefits in excess of contributions. That means these plans will need to earn higher returns to rebuild their assets to the previous levels. Plans with significant negative cash flows are more vulnerable to market declines.

This chart shows that STRS Ohio’s net cash flow ratio in 2001 was about -2% and has generally declined over this period such that in 2018 is almost -6% and is right at the 5th percentile of the Public Plan database. This measure provides some indication that this Plan is maturing at a pace faster than the typical public plan.

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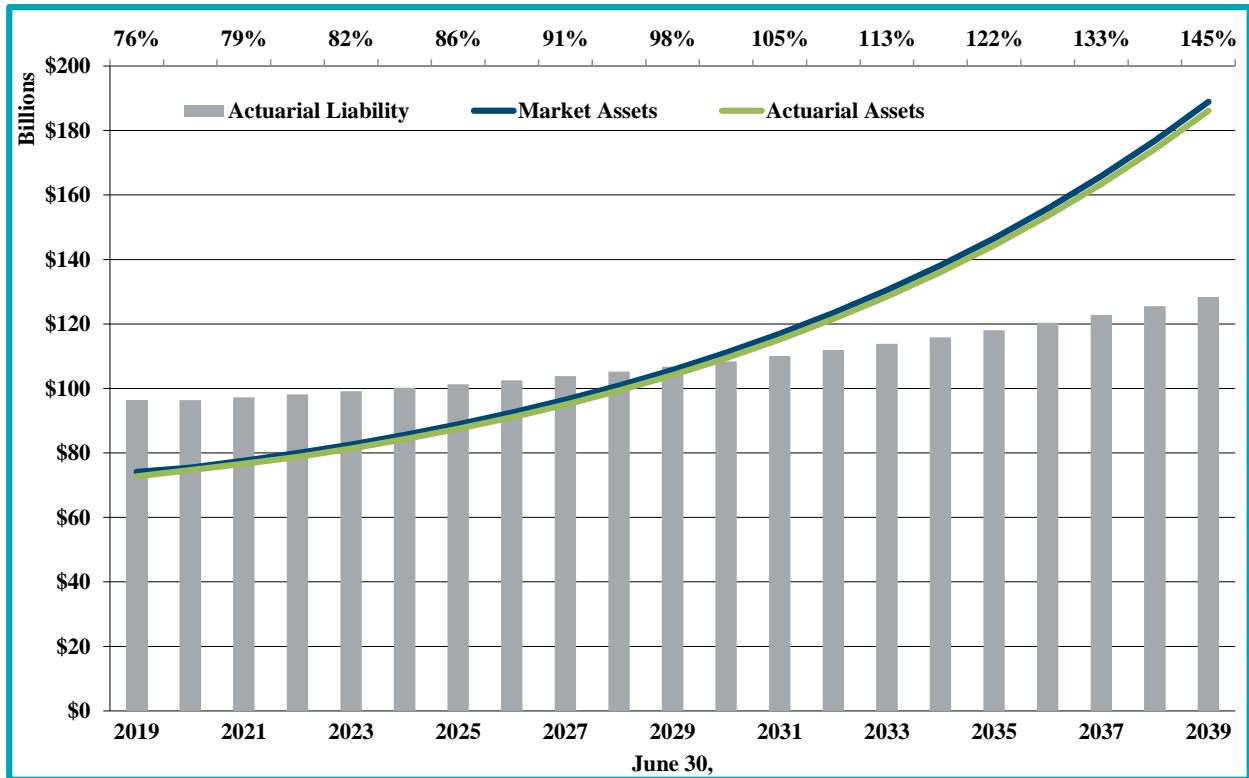
Assessment of Future Risks

The fundamental risk to the Plan is that contributions will not adequately fund Plan benefits. In assessing this risk we perform stress testing on the Plan’s funded status and contribution adequacy.

Stress Testing the Plan’s Funded Status

One of the ways to assess the investment risk is to project what will be the effect of investment returns not matching assumptions. The following two charts test the sensitivity of the Plan’s funded status to investment earnings that are 1% above and 1% below the assumed 7.45% to explore how potential deviations can impact the outlook of the Plan. Comparing these charts with the baseline projection shown on page 7 can give a sense of the risk due to investment return.

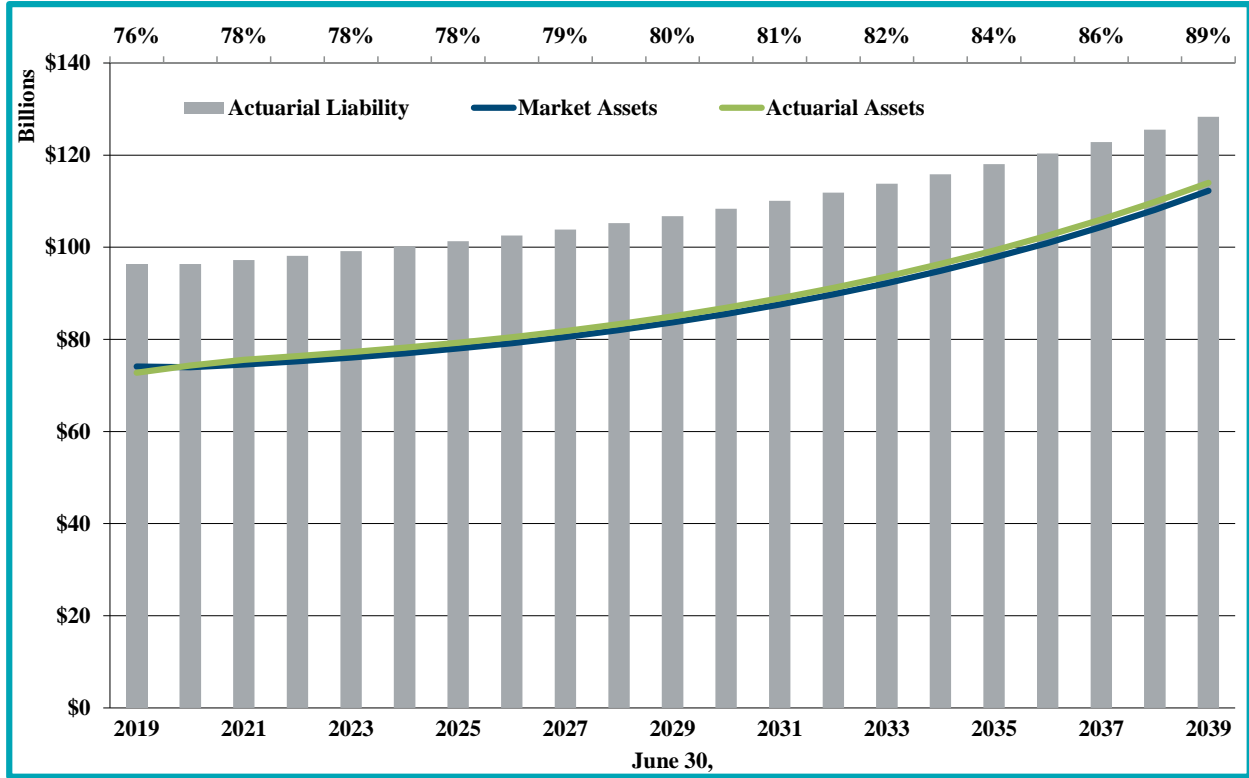
With 8.45% returns on the Market Value of Assets the funded ratio increases to 145% by the 2039 valuation, which compares to a ratio of 114% in the baseline projection.



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Assuming the annual return each year to be 6.45% will result in the funded ratio increasing to only 89% by the 2039 valuation.



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Stress Testing the Plan's contribution adequacy

In assessing contribution risk it is important to assess the adequacy of contributions, particularly in a plan with a fixed contribution rate. One way to assess adequacy is to compare the contributions to “tread water cost”. As shown on page 5, the Plan's tread water rate has decreased in recent years due to the change in the benefits provided by the Plan. In addition, the contributions allocated to the pension plan have increased so now the contribution rate is greater than the tread water rate.

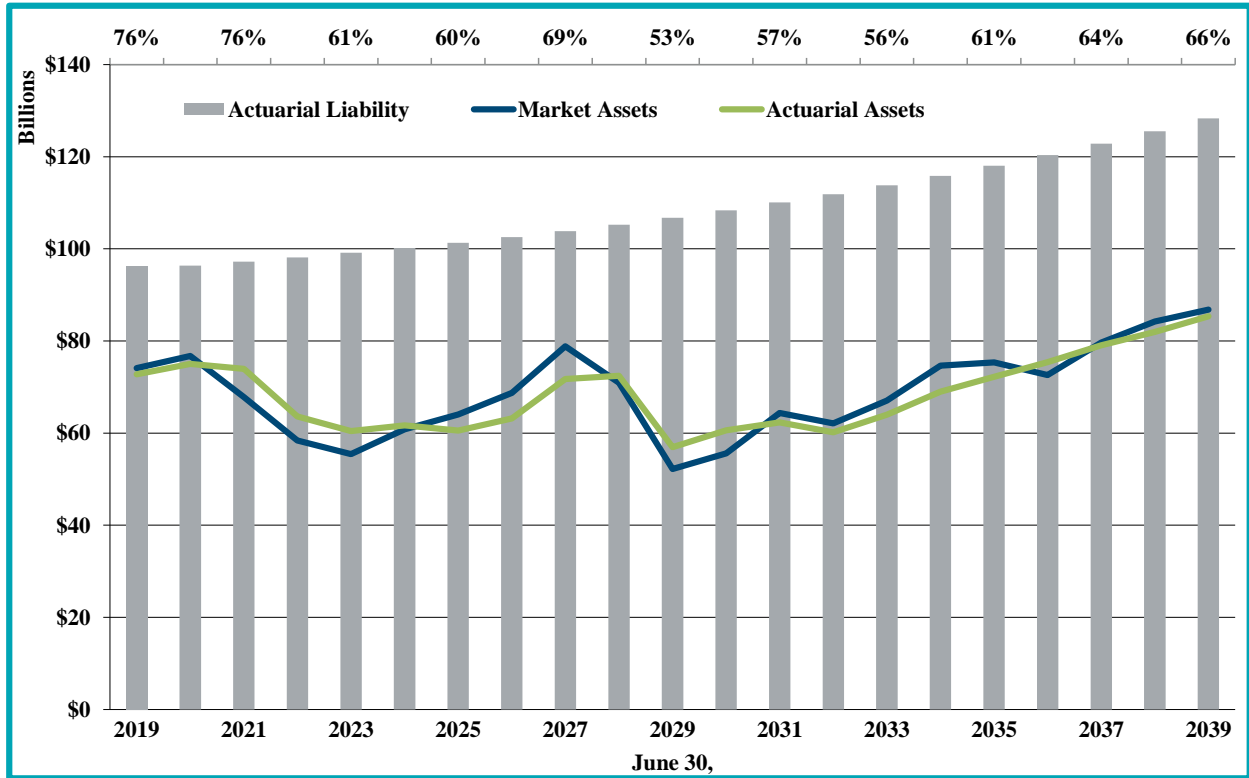
STRS also uses another measure to assess the adequacy of the current contribution rate. Since the contribution rate is fixed each year the System calculates the equivalent amortization period of a contribution based on amortizing the Unfunded Actuarial Liability. The chart on page 6 shows that the equivalent amortization period has decreased in recent years.

Assessing the future risk that the expected measurements produced by the actuarial valuations will deviate from the actual values over time is complex and can never be exactly known.

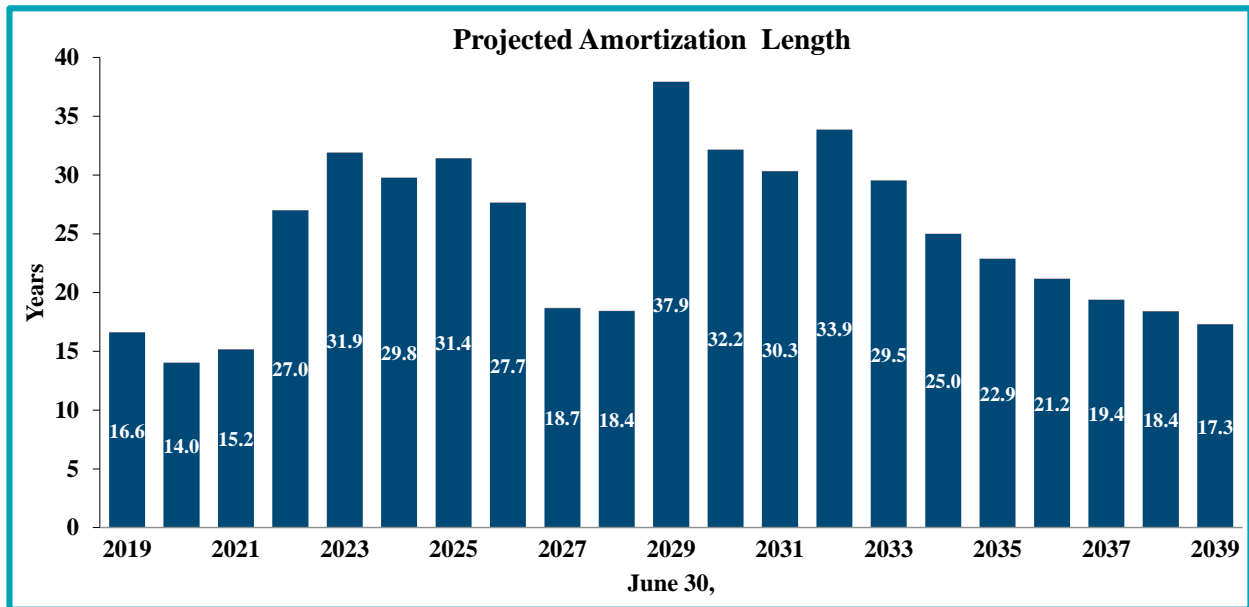
Page 7 shows the baseline projection of the Plan. It is important to note that baseline projections, while valid, **are not going to occur** as experience never conforms exactly to assumptions every year. As discussed in the plan maturity section, as plans become more mature it becomes more difficult to recover from market declines even when the average investment return over a long period is equal to the expected return. As a demonstration of this, the following projection is included, which is based on assuming varying returns in the future on the Market Value of Assets. We based these varying returns on assuming the returns for the next 20 years will be the same as those that actually occurred during the 20 year period from June 30, 1999 through June 30, 2019, shown in Table III-5 on page 26. This results in an average return of 6.2% over the next 20 years, which is below the current assumed return.

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
JUNE 30, 2019 ACTUARIAL VALUATION REPORT**

SECTION II – DISCLOSURES RELATED TO RISK



With varying annual earnings, one can see the volatility in the equivalent amortization period in the next chart. Note that this chart reflects an illustrative scenario and is not intended to reflect future expectations as the volatility of the equivalent amortization period will vary with the volatility of the returns.



**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
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SECTION III – 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 June 30, 2018 and June 30, 2019;
- 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. The actuarial Value of Assets are typically used by plans to smooth volatile market returns in order to provide for less volatile contributions. However, for plans like STRS Ohio that have a fixed contribution rate, the use of an Actuarial Value of Assets is not as relevant.

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
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SECTION III – ASSETS

Table III-1 below discloses and compares each asset value as of June 30, 2019 and June 30, 2018.

Table III-1					
Statement of Market Value of Assets as of June 30,					
	2019			2018	
	<u>Defined Benefit</u>	<u>Defined Contribution</u>	<u>Total</u>	<u>Total</u>	<u>% Change</u>
Assets					
Cash & Short-Term Investments	\$ 1,936,760,441	\$ 144,940,829	\$ 2,081,701,270	\$ 1,393,027,492	49.44%
Receivables	1,756,225,744	290,590	1,756,516,334	897,151,076	95.79%
Fixed Income	15,502,931,000	247,625,319	15,750,556,319	14,955,266,731	5.32%
Domestic Equities	19,956,720,975	910,451,674	20,867,172,649	21,619,790,970	(3.48%)
International Equities	16,378,934,239	201,866,092	16,580,800,331	16,943,223,177	(2.14%)
Real Estate	9,097,867,806	125,130,962	9,222,998,768	9,365,098,395	(1.52%)
Alternative Investments	12,440,162,801	0	12,440,162,801	11,788,798,845	5.53%
Invested Securities Lending Capital	456,855,862	0	456,855,862	1,716,920,855	(73.39%)
Capital Assets	242,775,977	0	242,775,977	249,428,228	(2.67%)
Accumulated Depreciation	(163,792,138)	0	(163,792,138)	(165,871,520)	(1.25%)
Total Assets	\$ 77,605,442,707	\$ 1,630,305,466	\$ 79,235,748,173	\$ 78,762,834,249	0.60%
Liabilities					
Securities Purchased and Other Investment Liabilities	\$ (1,083,767,659)	\$ 0	\$ (1,083,767,659)	\$ (200,871,482)	439.53%
Debt on Real Estate Investments	(1,769,568,283)	0	(1,769,568,283)	(1,767,714,541)	0.10%
Accrued Expenses and Other Liabilities	(31,408,885)	0	(31,408,885)	(34,298,513)	(8.42%)
Obligations Under Security Lending Program	(456,623,210)	0	(456,623,210)	(1,716,688,097)	(73.40%)
Net Pension Liability	(167,834,784)	0	(167,834,784)	(126,959,786)	32.20%
Total Liabilities	\$ (3,509,202,821)	\$ 0	\$ (3,509,202,821)	\$ (3,846,532,419)	(8.77%)
Market Value of Assets	\$ 74,096,239,886	\$ 1,630,305,466	\$ 75,726,545,352	\$ 74,916,301,830	1.08%

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
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SECTION III – 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 III-2 shows the changes in the market and Actuarial Value of Assets, Table III-3 shows the development of the gain/(loss) on assets for purposes of the determining the Actuarial Value of Assets, and Table III-4 shows the development of the Actuarial Value of Assets.

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
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SECTION III – ASSETS

**Table III-2
Changes in Value of Assets¹**

	<u>Market Value of Assets</u>	<u>Actuarial Value of Assets</u>
1. Value of Assets - June 30, 2018	\$ 73,457,567,076	\$ 71,656,623,566
2. Calculation of Net Cash Flow		
(a) Member Contributions	\$ 1,515,445,230	\$ 1,515,445,230
(b) Employer Contributions	1,614,188,340	1,614,188,340
(c) Transfers between Plans/from Other Systems	63,434,546	63,434,546
(d) Benefit Payments and Refunds	(7,258,652,124)	(7,258,652,124)
(e) Net Cash Flow	\$ (4,065,584,008)	\$ (4,065,584,008)
3. Value of Assets - June 30, 2019	\$ 74,096,239,886	\$ 72,781,530,276
4. Net Investment Income [3. - 1. - 2.(e)]	\$ 4,704,256,818	\$ 5,190,490,718
5. Average Value of Assets [1. + 1/2*2.(e)]	\$ 71,424,775,072	\$ 69,623,831,562
6. Rate of Return [4. / 5.]	6.59%	7.46%
7. Assumed Rate of Return	7.45%	7.45%
8. Expected Net Investment Income [5. * 7.]	\$ 5,321,145,743	\$ 5,186,975,451
9. Investment Gain/(Loss) [4. - 8.]	\$ (616,888,925)	\$ 3,515,267

¹Only includes assets for the Defined Benefit Plan. Defined Contribution Plan assets are not included.

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
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SECTION III – ASSETS

Table III-3	
Development of Gain/(Loss) on Assets for Smoothing¹	
1. Actuarial Value of Assets at June 30, 2018	\$ 71,656,623,566
2. Calculation of Net Cash Flow	
(a) Member Contributions	1,515,445,230
(b) Employer Contributions	1,614,188,340
(c) Transfers between Plans/from Other Systems	63,434,546
(d) Benefit Payments and Refunds	<u>(7,258,652,124)</u>
(e) Net Cash Flow	(4,065,584,008)
3. Average Actuarial Value of Assets [1. + 1/2*2.(e)]	69,623,831,562
4. Expected Income	5,186,975,451
5. Actual Income on Market Value of Assets	4,704,256,818
6. Gain/(Loss) for year ended June 30, 2019	\$ (482,718,633)

¹Only includes assets for the Defined Benefit Plan. Defined Contribution Plan assets are not included.

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
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SECTION III – ASSETS

Table III-4		
Development of Actuarial Value of Assets		
	Original Gain/(Loss)	Deferred Portion
Defer 0% of 2016 Gain/(Loss)	(4,778,548,000)	0
Defer 25% of 2017 Gain/(Loss)	3,843,661,053	960,915,263
Defer 50% of 2018 Gain/(Loss)	1,431,666,645	715,833,322
Defer 75% of 2019 Gain/(Loss)	(482,718,633)	<u>(362,038,975)</u>
Total Deferred Gain/(Loss) for AVA Calculation		\$ 1,314,709,610
Market Value of Assets at June 30, 2019		\$ 74,096,239,886
Total Unrecognized Gain/(Loss)		<u>1,314,709,610</u>
Preliminary Actuarial Value of Assets at June 30, 2019		\$ 72,781,530,276
Adjustment for 91% / 109% corridor		<u>0</u>
Actuarial Value of Pension Assets at June 30, 2019		72,781,530,276
Defined Contribution Plan Assets at June 30, 2019		<u>1,630,305,466</u>
Total Actuarial Value of Assets at June 30, 2019		74,411,835,742
Actuarial Value as a Percent of Market Value:		98.3%

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
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SECTION III – ASSETS

Investment Performance

The Market Value of Assets (MVA) earned 6.59% during the fiscal year ending June 30, 2019, which is less than the assumed 7.45% return for the period ending June 30, 2019. A return of 7.46% was experienced on the Actuarial Value of Assets (AVA), resulting in an actuarial gain for the year. Table III-5 shows the returns over the last 20 years.

Table III-5 Historic Investment Return		
Year Ending June 30,	Market Value	Actuarial Value
2019	6.6%	7.5%
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%
Average Returns		
Last 5 years:	7.1%	8.4%
Last 10 years:	10.2%	9.1%
Last 15 years:	7.5%	7.4%
Last 20 years:	6.2%	6.7%

STATE TEACHERS RETIREMENT SYSTEM OF OHIO
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SECTION IV – LIABILITIES

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

- **Disclosure** of the Plan liabilities as of June 30, 2018 and June 30, 2019, 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 Cost 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 IV-1, which follows, discloses each of these liabilities for the current and prior valuations.

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
JUNE 30, 2019 ACTUARIAL VALUATION REPORT**

SECTION IV – LIABILITIES

Table IV-1				
Liability Detail				
	June 30, 2019			June 30, 2018
	<u>Defined Benefit</u>	<u>Combined</u>	<u>Total</u>	<u>Total</u>
<u>Present Value of Future Benefits</u>				
Active Member Benefits	\$ 38,345,016,244	\$ 451,610,281	\$ 38,796,626,525	\$ 37,380,432,643
Reemployed Retiree Benefits	292,127,469	-	292,127,469	275,162,621
Inactive Benefits				
(i) Deferred Annuity	1,306,468,969	11,794,198	1,318,263,167	1,241,946,037
(ii) Contribution Refund	351,651,493	797,556	352,449,049	335,885,140
Retiree & Beneficiary Benefits				
(i) Annuity & Pension Reserve Fund	66,954,485,950	26,450,711	66,980,936,661	67,494,749,710
(ii) Survivor's Benefit Fund	1,139,019,052	-	1,139,019,052	1,141,160,505
Present Value of Future Benefits (PVB)¹	\$ 108,388,769,177	\$ 490,652,746	\$ 108,879,421,923	\$ 107,869,336,656
<u>Actuarial Liability</u>				
Active Member Benefits	\$ 25,878,299,930	\$ 249,543,603	\$ 26,127,843,533	\$ 24,956,417,785
Reemployed Retiree Benefits	292,127,469	-	292,127,469	275,162,621
Inactive Benefits	1,658,120,462	12,591,754	1,670,712,216	1,577,831,177
Retiree & Beneficiary Benefits	<u>68,093,505,002</u>	<u>26,450,711</u>	<u>68,119,955,713</u>	<u>68,635,910,215</u>
Defined Benefit Plan Actuarial Liability	95,922,052,863	288,586,068	96,210,638,931	95,445,321,798
Defined Contribution Account Balances	<u>1,630,305,466</u>	<u>-</u>	<u>1,630,305,466</u>	<u>1,458,734,754</u>
Total Actuarial Liability (AL)	\$ 97,552,358,329	\$ 288,586,068	\$ 97,840,944,397	\$ 96,904,056,552
Actuarial Value of Assets (AVA)			<u>\$ 74,411,835,742</u>	<u>\$ 73,115,358,320</u>
Net Unfunded/(Surplus) Actuarial Liability (AL-AVA)			\$ 23,429,108,655	\$ 23,788,698,232

¹ Excludes the Defined Contribution Account Balances.

SECTION IV – LIABILITIES

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.

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
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SECTION IV – LIABILITIES

In the table that follows, we show the components of change in the Actuarial Liability between June 30, 2018 and June 30, 2019.

Table IV-2	
Changes in Defined Benefit Actuarial Liability	
Liabilities as of June 30, 2018	\$ 95,445,321,798
Liabilities as of June 30, 2019	96,210,638,931
Liability Increase (Decrease)	765,317,133
Changes in Liability Due to:	
Method Changes	0
Benefit Changes	0
Assumption Changes	0
Experience (Gain)/Loss	(34,772,201)
Benefits Accumulated and Other Sources	800,089,334

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

Table IV-3	
Experience (Gain)/Loss by Source as of June 30, 2019	
Salary/Service Increase	\$ (207,875,241)
Retirement Experience	\$ 206,548,589
Retiree Mortality	\$ (152,787,768)
New Entrants	\$ 36,472,067
Data composition and other changes	<u>\$ 82,870,152</u>
Experience (Gain)/Loss	\$ (34,772,201)

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
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SECTION V – 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 V-1 shows the development of the employer contribution rates.

Table V-1				
Development of Employer Contribution Rate				
	2019			2018
	Defined Benefit	Combined	Total	Total
Valuation Results				
Total Actuarial Liability	\$ 97,552,358,329	\$ 288,586,068	\$ 97,840,944,397	\$ 96,904,056,552
Actuarial Value of Pension Assets			74,411,835,742	73,115,358,320
Unfunded Actuarial Liability			\$ 23,429,108,655	\$ 23,788,698,232
Total Normal Cost	\$ 1,134,811,994	\$ 15,714,300	\$ 1,150,526,294	\$ 1,129,449,183
Normal Cost Rate	10.83%	3.99%	10.58%	10.67%
Member Contribution Rate	14.00%	2.00%	13.57%	13.58%
Allocation of Employer Contribution Rate				
Employer Normal Cost Rate	(3.17%)	1.99%	(2.98%)	(2.91%)
Unfunded Actuarial Liability Rate	17.17%	12.01%	16.98%	16.91%
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%

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
JUNE 30, 2019 ACTUARIAL VALUATION REPORT**

SECTION V – 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 16.6 years. Table V-2 shows the development of the funding period based on these contributions.

Table V-2		
Development of Funding Period Based on Employer Contribution Rate		
	<u>2019</u>	<u>2018</u>
	<u>Total</u>	<u>Total</u>
Valuation Results		
Total Defined Benefit Plan Payroll	\$ 11,403,099,283	\$ 11,125,398,457
STRS Defined Contribution Plan Payroll	\$ 452,129,552	\$ 425,037,922
Alternative Retirement Plan Payroll	\$ 792,126,323	\$ 757,568,817
Total Actuarial Accrued Liability	\$ 97,840,944,397	\$ 96,904,056,552
Actuarial Value of Pension Assets	<u>74,411,835,742</u>	<u>73,115,358,320</u>
Unfunded Actuarial Liability (UAL)	\$ 23,429,108,655	\$ 23,788,698,232
UAL Rate for Defined Benefit Plan*	16.98%	16.91%
Defined Benefit Plan UAL Contribution*	\$ 1,936,368,000	\$ 1,881,024,803
Defined Contribution Plan UAL Contribution*	20,210,191	18,999,195
Alternative Retirement Plan UAL Contribution*	<u>35,408,047</u>	<u>33,863,326</u>
Total Contribution for UAL*	\$ 1,991,986,238	\$ 1,933,887,324
Amortization Period*	16.6 Years	17.8 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 payrolls 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

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
JUNE 30, 2019 ACTUARIAL VALUATION REPORT**

SECTION V – CONTRIBUTIONS

Liability and the 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 June 30, 2019, the remaining amortization period is 26 years.

Table V-3 shows the development of an actuarially determined contribution rate and contribution rate sufficiency. Based on this valuation, the actuarially determined contribution rate for Fiscal 2020 is 9.75% 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 in that fiscal year. 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 V-3		
Actuarially Determined Contribution and Contribution Rate Sufficiency		
	<u>2019</u>	<u>2018</u>
	<u>Total</u>	<u>Total</u>
Valuation Results		
Total Defined Benefit Plan Valuation Payroll	\$ 11,403,099,283	\$ 11,125,398,457
STRS Defined Contribution Plan Payroll	\$ 452,129,552	\$ 425,037,922
Alternative Retirement Plan Payroll	\$ 792,126,323	\$ 757,568,817
Total Actuarial Accrued Liability	\$ 97,840,944,397	\$ 96,904,056,552
Actuarial Value of Pension Assets	74,411,835,742	73,115,358,320
Unfunded Actuarial Liability	<u>\$ 23,429,108,655</u>	<u>\$ 23,788,698,232</u>
Amortization Period	26	27
Amortization Payment	\$ 1,507,874,214	\$ 1,500,007,141
Offset for Defined Contribution Contribution to UAL*	20,210,191	18,999,195
Offset for Alternative Retirement Plan Contribution to UAL*	35,408,047	33,863,326
UAL Amortization Payment from Defined Benefit Plan*	<u>\$ 1,452,255,976</u>	<u>\$ 1,447,144,619</u>
Defined Benefit Plan Rate to Amortize UAL	12.74%	13.01%
Employer Normal Cost Rate	(2.98%)	(2.91%)
Actuarial Determined Contribution Rate*	9.75%	10.10%
Statutory Employer Contribution	<u>14.00%</u>	<u>14.00%</u>
Contribution Sufficiency/(Deficiency)	4.25%	3.90%

*Assumes payments are made throughout the year

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
JUNE 30, 2019 ACTUARIAL VALUATION REPORT**

SECTION VI – 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: Schedule of Funded Liabilities by Type
- Table VI-3: Actuarial Funded Ratio and Funding Period

Table VI-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	2015	2016	2017	2018	2019
Investment income	\$ 1,068,184	\$ 774,260	\$ 857,418	\$ (253,993)	\$ 3,515
Payroll growth	(26,173)	(40,874)	7,091	N/A	N/A
Salary increases	21,385	236,054	279,058	180,810	207,875
Retirement and other separation experience	(1,064,240)	(333,342)	(316,922)	(285,353)	(325,891)
Death after Retirement	(223,251)	(336,967)	27,307	(9,495)	152,788
Final plan reselection	(8,240)	(9,569)	(1,403)	N/A	N/A
Gain (or loss) during year	<u>\$ (232,335)</u>	<u>\$ 289,562</u>	<u>\$ 852,549</u>	<u>\$ (368,031)</u>	<u>\$ 38,287</u>
Gain (or loss) due to assumption/method/plan amendment changes	-	-	415,862	236,418	-
Composite gain (or loss) during the year	<u>\$ (232,335)</u>	<u>\$ 289,562</u>	<u>\$ 1,268,411</u>	<u>\$ (131,613)</u>	<u>\$ 38,287</u>

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
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SECTION VI – ACCOUNTING STATEMENT INFORMATION

**Table VI-2
Schedule of Funded Liabilities by Type (Dollars in Thousands)***

Valuation Date June 30,	Aggregate Actuarial Liabilities for			Actuarial Value of Assets (Excl Healthcare)	Portion of Actuarial Liabilities Covered by Actuarial Value of Assets		
	Active Member Contributions	Retirees & Beneficiaries	Active Members Employer Financed Portion		(1)	(2)	(3)
	(1)	(2)	(3)				
2019	\$ 16,454,187	\$ 68,412,083	\$ 12,974,674	\$ 74,411,836	100%	85%	0%
2018	\$ 15,440,336	\$ 68,911,073	\$ 12,552,648	\$ 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%

*Includes Defined Contribution Plan

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SECTION VI – ACCOUNTING STATEMENT INFORMATION

Table VI-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
6/30/2019	\$ 74,411,836	\$ 97,840,944	\$ 23,429,109	76.1%	16.6 years
6/30/2018	\$ 73,115,358	\$ 96,904,057	\$ 23,788,699	75.5%	17.8 years
6/30/2017	\$ 72,216,212	\$ 96,126,440	\$ 23,910,228	75.1%	18.4 years
6/30/2016	\$ 70,114,637	\$ 100,756,422	\$ 30,641,785	69.6%	26.6 years
6/30/2015	\$ 68,655,999	\$ 99,014,654	\$ 30,358,655	69.3%	28.4 years
6/30/2014	\$ 66,657,175	\$ 96,167,057	\$ 29,509,882	69.3%	29.5 years
6/30/2013	\$ 62,590,786	\$ 94,366,694	\$ 31,775,908	66.3%	40.2 years
6/30/2012	\$ 59,489,508	\$ 106,301,841	\$ 46,812,333	56.0%	Infinite Years
6/30/2011	\$ 58,110,495	\$ 98,766,204	\$ 40,655,709	58.8%	Infinite Years
6/30/2010	\$ 55,946,259	\$ 94,720,669	\$ 38,774,410	59.1%	Infinite Years

**note: Due to rounding, the assets plus the unfunded liabilities may not sum to the total liabilities*

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SECTION VII - GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2019

Overview

The purpose of this section is to provide accounting and financial disclosure information under Governmental Accounting Standards Board Statements 67 and 68 (GASB 67 and 68) for the State Teachers Retirement System of Ohio as of June 30, 2019. 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.

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SECTION VII - GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2019

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, 2019.

Note Disclosures

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

Table VII-1			
Change in Net Pension Liability			
	Increase (Decrease)		
	Total Pension Liability (a)	Plan Fiduciary Net Position (b)	Net Pension Liability (a) - (b)
Balances at 6/30/2018	\$ 96,904,056,552	\$ 74,916,301,830	\$ 21,987,754,722
Changes for the year:			
Service cost	1,129,449,183		1,129,449,183
Interest	7,036,513,817		7,036,513,817
Changes of benefits	0		0
Differences between expected and actual experience	69,329,945		69,329,945
Changes of assumptions	0		0
Contributions - employer*		1,702,153,814	(1,702,153,814)
Contributions - member		1,623,095,460	(1,623,095,460)
Net investment income		4,847,516,616	(4,847,516,616)
Benefit payments	(7,298,405,100)	(7,298,405,100)	0
Administrative expense		(64,117,268)	64,117,268
Net changes	<u>936,887,845</u>	<u>810,243,522</u>	<u>126,644,323</u>
Balances at 6/30/2019	<u>\$ 97,840,944,397</u>	<u>\$ 75,726,545,352</u>	<u>\$ 22,114,399,045</u>

*Includes Defined Contribution and Alternative Retirement Plan.

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

Total contributions and investment income were less than the service cost, interest cost, administrative expenses and unfavorable experience, resulting in an increase in the NPL of \$127 million. The NPL remaining as of June 30, 2019 is \$22.1 billion.

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SECTION VII - GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2019

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 VII-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	\$ 108,044,275,861	\$ 97,840,944,397	\$ 89,203,301,598
Plan Fiduciary Net Position	<u>75,726,545,352</u>	<u>75,726,545,352</u>	<u>75,726,545,352</u>
Net Pension Liability	<u>\$ 32,317,730,509</u>	<u>\$ 22,114,399,045</u>	<u>\$ 13,476,756,246</u>
Plan Fiduciary Net Position as a Percentage of the Total Pension Liability	70.1%	77.4%	84.9%

A one percent decrease in the discount rate increases the TPL by approximately 10.4% and increases the NPL by approximately 46.1%. A one percent increase in the discount rate decreases the TPL by approximately 8.8% and decreases the NPL by approximately 39.1%.

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SECTION VII - GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2019

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 year.

Table VII-3		
Schedule of Changes in Net Pension Liability and Related Ratios		
	FYE 2019	FYE 2018
<u>Total Pension Liability</u>		
Service cost	\$ 1,129,449,183	\$ 1,075,333,908
Interest (includes interest on service cost)	7,036,513,817	6,974,352,400
Changes of benefit terms	0	0
Differences between expected and actual experience	69,329,945	31,731,963
Changes of assumptions	0	0
Benefit payments, including refunds of member contributions	(7,298,405,100)	(7,303,802,181)
Net change in total pension liability	\$ 936,887,845	\$ 777,616,090
Total pension liability - beginning	96,904,056,552	96,126,440,462
Total pension liability - ending	\$ 97,840,944,397	\$ 96,904,056,552
<u>Plan fiduciary net position</u>		
Contributions - employer*	\$ 1,702,153,814	\$ 1,634,027,228
Contributions - member	1,623,095,460	1,580,429,592
Net investment income	4,847,516,616	6,697,727,752
Benefit payments, including refunds of member contributions	(7,298,405,100)	(7,303,802,181)
Administrative expense	(64,117,268)	(63,306,680)
Net change in plan fiduciary net position	\$ 810,243,522	\$ 2,545,075,711
Plan fiduciary net position - beginning	74,916,301,830	72,371,226,119
Plan fiduciary net position - ending	\$ 75,726,545,352	\$ 74,916,301,830
Net pension liability - ending	\$ 22,114,399,045	\$ 21,987,754,722
Plan fiduciary net position as a percentage of the total pension liability	77.40%	77.31%
Covered payroll*	\$ 12,296,800,239	\$ 11,923,688,122
Net pension liability as a percentage of covered payroll	179.84%	184.40%

*Includes Defined Contribution and Alternative Retirement Plans.

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SECTION VII - GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2019

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 VII-4 Schedule of Employer Contributions					
	FYE 2019	FYE 2018	FYE 2017	FYE 2016	FYE 2015
Actuarially Determined Contribution* Contributions in Relation to the Actuarially Determined Contribution*	\$ 1,088,328,150	\$ 1,056,430,306	\$ 1,054,862,000	\$ 1,178,129,000	\$ 1,368,602,000
	<u>1,614,188,340</u>	<u>1,565,679,329</u>	<u>1,514,285,000</u>	<u>1,466,938,000</u>	<u>1,449,165,000</u>
Contribution Deficiency/(Excess)	<u>\$ (525,860,190)</u>	<u>\$ (509,249,023)</u>	<u>\$ (459,423,000)</u>	<u>\$ (288,809,000)</u>	<u>\$ (80,563,000)</u>
Covered Payroll*	\$ 11,088,784,826	\$ 10,775,526,239	\$ 10,459,706,000	\$ 10,069,269,000	\$ 9,985,181,000
Contributions as a Percentage of Covered Payroll	14.56%	14.53%	14.48%	14.57%	14.51%
	FYE 2014	FYE 2013	FYE 2012	FYE 2011	FYE 2010
Actuarially Determined Contribution* Contributions in Relation to the Actuarially Determined Contribution*	\$ 1,489,734,000	\$ 2,910,537,000	\$ 3,248,651,000	\$ 2,715,523,000	\$ 2,623,624,000
	<u>1,325,141,000</u>	<u>1,327,862,000</u>	<u>1,349,561,000</u>	<u>1,379,104,000</u>	<u>1,374,327,000</u>
Contribution Deficiency/(Excess)	<u>\$ 164,593,000</u>	<u>\$ 1,582,675,000</u>	<u>\$ 1,899,090,000</u>	<u>\$ 1,336,419,000</u>	<u>\$ 1,249,297,000</u>
Covered Payroll*	\$ 9,833,028,000	\$ 9,917,911,000	\$ 10,102,509,000	\$ 10,369,367,000	\$ 10,341,512,000
Contributions as a Percentage of Covered Payroll	13.48%	13.39%	13.36%	13.30%	13.29%

*Excludes the Defined Contribution and Alternative Retirement Plans.

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SECTION VII - GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2019

The notes below summarize the key methods and assumptions used to determine the Actuarially Determined Contributions (ADC) for FYE 2019.

Notes to Schedule

Valuation Date: June 30, 2018

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, 2019 can be found in the June 30, 2018 actuarial valuation report.

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SECTION VII - GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2019

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, 2019 measurement date, can be used for employers' reporting up until fiscal years ending June 30, 2020.

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 \$69.3 million.

The impact of investment gains or losses is recognized over a period of five years. During the measurement year, there was an investment loss of \$586.1 million.

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SECTION VII - GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2019

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

Table VII-5					
Calculation of Deferred Items Schedule					
Experience Recognition Year	Recognition Period	Total Amount	Remaining Years	Recognized in Pension Expense	Deferred Resources
Recognition of Experience (Gains) and Losses					
2019	5	\$ 69,329,945	5	\$ 13,865,989	\$ 55,463,956
2018	5	31,731,963	4	6,346,393	\$ 19,039,177
2017	5	(239,322,183)	3	(47,864,437)	\$ (95,728,872)
2016	5	527,724,561	2	105,544,912	\$ 105,544,913
2015	5	1,355,346,526	1	271,069,306	\$ 0
Total		\$ 1,744,810,812		\$ 348,962,163	\$ 84,319,174
Recognition of Assumption Changes					
2017	5	\$ 6,494,407,977	3	\$ 1,298,881,595	\$ 2,597,763,192
Total		\$ 6,494,407,977		\$ 1,298,881,595	\$ 2,597,763,192
Recognition of Investment (Gains) and Losses					
2019	5	\$ 586,060,713	5	\$ 117,212,143	\$ 468,848,570
2018	5	(1,457,979,231)	4	(291,595,846)	\$ (874,787,539)
2017	5	(4,180,129,249)	3	(836,025,850)	\$ (1,672,051,699)
2016	5	4,985,793,479	2	997,158,696	\$ 997,158,695
2015	5	1,734,151,476	1	346,830,296	\$ 0
Total		\$ 1,667,897,188		\$ 333,579,439	\$ (1,080,831,973)

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SECTION VII - GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2019

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 VII-6		
Schedule of Deferred Inflows and Outflows of Resources		
	Deferred Outflows of Resources	Deferred Inflows of Resources
Differences between expected and actual experience	\$ 180,048,046	\$ 95,728,872
Changes in assumptions	2,597,763,192	0
Net difference between projected and actual earnings on pension plan investments	-	1,080,831,973
Total	<u><u>\$ 2,777,811,238</u></u>	<u><u>\$ 1,176,560,845</u></u>
Amounts reported as deferred outflows and deferred inflows of resources will be recognized in pension expense as follows:		
Measurement year ended June 30:		
2020	1,363,523,595	
2021	260,819,992	
2022	(154,171,325)	
2023	131,078,130	
2024	0	
Thereafter	\$ 0	

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SECTION VII - GASB 67 AND 68 INFORMATION AS OF JUNE 30, 2019

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 VII-7 Calculation of Pension Expense		
	Measurement Year Ending	
	2019	2018
Change in Net Pension Liability	\$ 126,644,323	\$ (1,767,459,622)
Change in Deferred Outflows	1,626,378,250	1,708,651,777
Change in Deferred Inflows	(300,345,711)	501,498,973
Employer Contributions	<u>1,702,153,814</u>	<u>1,634,027,228</u>
Pension Expense	\$ 3,154,830,676	\$ 2,076,718,356
Pension Expense as % of Payroll	25.66%	17.42%
Operating Expenses		
Service cost	\$ 1,129,449,183	\$ 1,075,333,908
Employee contributions	(1,623,095,460)	(1,580,429,592)
Administrative expenses	<u>64,117,268</u>	<u>63,306,680</u>
Total	\$ (429,529,009)	\$ (441,789,004)
Financing Expenses		
Interest cost	\$ 7,036,513,817	\$ 6,974,352,400
Expected return on assets	<u>(5,433,577,329)</u>	<u>(5,239,748,521)</u>
Total	\$ 1,602,936,488	\$ 1,734,603,879
Changes		
Benefit changes	\$ 0	\$ 0
Recognition of assumption changes	1,298,881,595	1,298,881,595
Recognition of liability gains and losses	348,962,163	393,637,707
Recognition of investment gains and losses	<u>333,579,439</u>	<u>(908,615,821)</u>
Total	\$ 1,981,423,197	\$ 783,903,481
Pension Expense	\$ 3,154,830,676	\$ 2,076,718,356

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APPENDIX A – MEMBERSHIP INFORMATION

		Table A-1 Ohio State Teachers - Member Status Reconciliation							
		Reemployed		Inactive Eligible		Inactive Eligible			
		Actives	Retirees	for Allowance	for Refunds Only	Retired	Disabled Beneficiaries	Total	
1.	June 30, 2018 Valuation	170,327	22,038	18,416	138,075	134,718	5,314	17,390	506,278
2.	Additions								
	a. New Entrants	10,838	1,705	-	-	-	-	-	12,543
	b. Total	10,838	1,705	-	-	-	-	-	12,543
3.	Reductions								
	a. Benefits Expired	-	-	-	-	-	-	-	-
	b. Refunds	(2,175)	(2,815)	(875)	(6,257)	-	-	-	(12,122)
	c. Deaths with no Beneficiaries	(57)	(32)	(33)	-	(2,393)	(132)	(1,068)	(3,715)
	d. Total	(2,232)	(2,847)	(908)	(6,257)	(2,393)	(132)	(1,068)	(15,837)
4.	Changes in Status								
	a. Rehired	4,940	-	(1,058)	(3,639)	-	(9)	-	234
	b. Inactive Eligible for Allowance	(2,619)	-	2,704	(3)	-	(11)	-	71
	c. Inactive Eligible for Refunds Only	(8,218)	-	(3)	11,265	-	-	-	3,044
	d. Retired	(2,731)	(139)	(330)	(8)	3,161	(34)	-	(81)
	e. Reemployed Retiree	(15)	238	-	(15)	-	-	-	208
	f. Disabled	(140)	-	(12)	-	-	152	-	-
	g. Death with Beneficiaries	(121)	-	(6)	(7)	(1,142)	(109)	1,385	-
	h. Plan Reselection	-	-	-	-	-	-	-	-
	i. Data Corrections	(25)	31	-	10	121	12	63	212
	j. Total	(8,929)	130	1,295	7,603	2,140	1	1,448	3,688
5.	June 30, 2019 Valuation	170,004	21,026	18,803	139,421	134,465	5,183	17,770	506,672

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APPENDIX A – MEMBERSHIP INFORMATION

Table A-2 Summary of Membership Data as of June 30, 2019 (\$ in thousands)			
	Male	Female	Total
1. Defined Benefit Plan Active Members			
Number of Members	45,833	117,646	163,479
Annual Salaries (for period ending June 30, 2018)	\$ 3,062,544	\$ 7,082,124	\$ 10,144,667
Average Age	45.06	43.75	44.12
Average Service	13.08	12.98	13.01
2. Combined Plan Active Members			
Number of Members	1,423	5,102	6,525
Annual Salaries (for period ending June 30, 2018)	\$ 90,315	\$ 288,624	\$ 378,939
Average Age	43.51	41.14	41.66
Average Service	8.56	9.04	8.94
3. Total Defined Benefit and Combined Plan Active Members			
Number of Members	47,256	122,748	170,004
Annual Salaries (for period ending June 30, 2018)	\$ 3,152,858	\$ 7,370,749	\$ 10,523,607
Average Age	45.01	43.64	44.02
Average Service	12.94	12.81	12.85
4. Defined Benefit Inactive Members			
Eligible for Allowances	4,391	13,825	18,216
Eligible for Refunds Only	49,548	88,547	138,095
Total	53,939	102,372	156,311
5. Combined Benefit Inactive Members			
Eligible for Allowances	107	480	587
Eligible for Refunds Only	311	1,015	1,326
Total	418	1,495	1,913
6. Total Inactive Members			
Eligible for Allowances	4,498	14,305	18,803
Eligible for Refunds Only	49,859	89,562	139,421
Total	54,357	103,867	158,224

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APPENDIX A – MEMBERSHIP INFORMATION

Table A-2 Summary of Membership Data as of June 30, 2019 (continued) (\$ in thousands)			
	Male	Female	Total
7. Retirees			
Number of Members	44,412	90,053	134,465
Annual Allowance	\$ 2,384,754	\$ 3,882,103	\$ 6,266,857
Average Allowance (in dollars)	\$ 53,696	\$ 43,109	\$ 46,606
8. Disabled Retirees			
Number of Members	1,580	3,603	5,183
Annual Allowance	\$ 66,559	\$ 131,820	\$ 198,379
Average Allowance (in dollars)	\$ 42,126	\$ 36,586	\$ 38,275
9. Beneficiaries Receiving Optional Allowances			
Number of Members	3,365	8,515	11,880
Annual Allowance	\$ 78,404	\$ 302,889	\$ 381,293
Average Allowance (in dollars)	\$ 23,300	\$ 35,571	\$ 32,095
10. Survivors' Benefit Fund Beneficiaries			
Number of Members	2,699	3,191	5,890
Annual Allowance	\$ 48,992	\$ 75,634	\$ 124,626
Average Allowance (in dollars)	\$ 18,152	\$ 23,702	\$ 21,159
11. Total Retirees and Beneficiaries			
Number of Members	52,056	105,362	157,418
Annual Allowance	\$ 2,578,709	\$ 4,392,446	\$ 6,971,155
Average Allowance (in dollars)	\$ 49,537	\$ 41,689	\$ 44,284

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
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APPENDIX A – MEMBERSHIP INFORMATION

Table A-3					
Schedule of Valuation Data - Active Members					
Valuation Date June 30,	Number of Active Members	Annualized Salaries*	Annual Average Pay	% Increase in Average Pay	
2019	170,004	\$ 10,849,863	\$ 63,821	2.73%	
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%	

*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	
2019	157,418	\$ 6,971,155	\$ 44,284	0.3%	
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%	

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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	
2019	157,422	\$ 6,949,422	4,894	\$ 178,255	4,898	\$ 156,522	157,418	\$ 6,971,155	
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	

STATE TEACHERS RETIREMENT SYSTEM OF OHIO
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APPENDIX A – MEMBERSHIP INFORMATION

Table A-6 Benefit Payments by Type as of June 30, 2019				
Age Last Birthday	Number	Annual Allowance (in thousands)		Average Annual Allowance
Retirees				
Under 60	5,528	\$	276,747	\$ 50,063
60-64	15,009		743,978	49,569
65-69	33,024		1,629,475	49,342
70-74	33,285		1,646,980	49,481
75-79	21,402		982,191	45,892
Over 79	26,217		987,486	37,666
Total	134,465	\$	6,266,857	\$ 46,606
Disabled Retirees				
Under 60	1,167	\$	42,633	\$ 36,532
60-64	724		28,030	38,715
65-69	926		38,714	41,808
70-74	1,011		42,245	41,785
75-79	649		24,695	38,051
Over 79	706		22,062	31,249
Total	5,183	\$	198,379	\$ 38,275
Beneficiaries Receiving Optional Allowances				
Under 60	35	\$	1,288	\$ 36,800
60-64	154		6,407	41,604
65-69	680		28,420	41,794
70-74	1,410		58,755	41,670
75-79	1,748		65,456	37,446
Over 79	7,853		220,967	28,138
Total	11,880	\$	381,293	\$ 32,095
Survivors' Benefit Fund Beneficiaries				
Under 60	1,345	\$	16,269	\$ 12,096
60-64	424		9,148	21,575
65-69	851		21,735	25,541
70-74	889		22,595	25,416
75-79	781		19,323	24,741
Over 79	1,600		35,556	22,223
Total	5,890	\$	124,626	\$ 21,159
Grand Total	157,418	\$	6,971,155	\$ 44,284

**STATE TEACHERS RETIREMENT SYSTEM OF OHIO
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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 July 1, 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%

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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%

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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%

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APPENDIX B – SUMMARY OF ASSUMPTIONS AND METHODS

Defined Benefit Plan – Non-grandfathered Male Rates				
Age	Under 25 Years of Service	25-29 Years of Service¹	30-34 Years of Service²	35 or More Years of Service²
<=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).

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APPENDIX B – SUMMARY OF ASSUMPTIONS AND METHODS

Defined Benefit Plan – Non-grandfathered Female Rates				
Age	Under 25 Years of Service	25-29 Years of Service¹	30-34 Years of Service²	35 or More Years of Service²
<=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).

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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%

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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.

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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 contribution 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.

APPENDIX B – SUMMARY OF ASSUMPTIONS AND METHODS

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.

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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:

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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

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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 retires 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.

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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

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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.

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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.

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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.

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APPENDIX C – SUMMARY OF PLAN PROVISIONS

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.

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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.

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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.

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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.

In addition, 4.47% of salary of the salaries of Alternative Retirement Plan members is used to fund 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:

$$\begin{array}{ccccccc}
 \text{Amount} & & \text{Probability of} & & \text{1/(1+Investment Return)} & & \\
 & & \text{Payment} & & & & \\
 \$100 & \times & (1 - .01) & \times & 1/(1+.1) & = & \$90
 \end{array}$$

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.

APPENDIX D – GLOSSARY OF TERMS

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.

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.