Teachers' Retirement System of Oklahoma

Actuarial Valuation Report
As of June 30, 2019

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October 23, 2019

Board of Trustees
Teachers' Retirement System of Oklahoma
Oliver Hodge Education Building
2500 N. Lincoln Boulevard, 5th Floor
Oklahoma City, Oklahoma 73105

Subject: Actuarial Valuation as of June 30, 2019

Dear Members of the Board:

We certify that the information contained in this report is accurate and fairly presents the actuarial position of the Teachers' Retirement System of Oklahoma (the "System" or "OTRS") as of June 30, 2019. This report was prepared at the request of the Board and is intended for use by the System's staff and those designated or approved by the Board. This report may be provided to parties other than the staff only in its entirety and only with the permission of the Board.

All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, the results presented also comply with the requirements of the Oklahoma statutes and, where applicable, the Internal Revenue Code. The undersigned are independent actuaries. They are Enrolled Actuaries and Members of the American Academy of Actuaries, and they are experienced in performing valuations for large public retirement systems. They meet all of the Qualification Standards of the American Academy of Actuaries.

Valuations are prepared annually, as of June 30th of each year, the last day of the System's plan and fiscal years.

ACTUARIAL VALUATION

The primary purposes of the actuarial valuation report are to determine the adequacy of the current employer contribution rates and the level of dedicated State revenue, to describe the current financial condition of the System, and to analyze changes in the System's condition. In addition, the report provides various summaries of the data.

All of the information required by GASB is provided in stand-alone reports prepared in accordance with GASB Statement Nos. 67 and 74 for the OTRS fiscal year ending June 30, 2019.

Financing Objectives

The member, employer, and "grant matching" contribution rates, as well as the dedicated State revenue, are established by law. Members contribute 7.00% of covered compensation. The contribution rate for employers covered by the Education Employees Service Incentive Plan (EESIP) is 9.50%. For employers not covered by the EESIP—the comprehensive and regional four-year universities—the contribution rate is 8.55%. No employer contribution rate changes are currently scheduled. There is also an additional contribution made by the comprehensive universities, the Initial Funding Surcharge, which is equal to 2.50% of the payroll for those employees who elect to join the Alternate Retirement Plan in lieu of joining the System. This contribution will continue through FY 2034 or until June 30 of the year in which the unfunded actuarial accrued liability of the participating institutions is reduced to zero, if earlier. In addition, the State of Oklahoma contributes a percentage of its revenues from sales taxes, use taxes, corporate income taxes, individual income taxes, and lottery proceeds to the System. This percentage is currently 5.00%, and no changes are scheduled in this rate. Additionally, the System receives "grant matching" contributions from employers for positions whose funding comes from federal sources or certain grants. The matching contribution rate for FY 2019 was 7.70% and will continue to be 7.70% for FY 2020.

For the fiscal year ending June 30, 2019, the dedicated State revenue plus the matching contribution was equivalent to a contribution rate of approximately 8.3% of covered payroll. However, because these contribution sources are unrelated to the covered payroll of the System, our outlook for the future contribution level from these sources also incorporates the prior four years of actual contributions, resulting in a five-year average of 7.8%. The Initial Funding Surcharge has been excluded from this outlook for future contribution levels since it will only be paid for a temporary period of time.

The employer payroll contribution—9.50% for most employers and 8.55% for the comprehensive and regional universities—is projected to average about 9.3% of payroll, so on a combined basis, we expect that the contributing entities will contribute 17.1% of covered payroll (7.8% + 9.3% = 17.1%) in the future.

The dedicated State revenue along with the local and matching contributions, when combined with the contributions made by members, are intended to pay for the normal cost and to amortize the unfunded actuarial accrued liability of the System.

Deferred Asset Losses/Gains

The actuarial value of assets is based upon the market value, but asset gains and losses – earnings greater or less than the assumed annual investment return – are recognized at a rate of 20% per year for five years.

The market value of assets returned 4.9% for the fiscal year ending June 30, 2019. The actuarial value of assets had a greater return of 6.0% due to the asset smoothing method but still trailed the assumed rate of 7.50%. The return deficit on an actuarial value of assets basis resulted in an asset loss of almost $248 million and a decrease in the System's funded ratio of about 1.0%. It should be noted that results based on the actuarial value, as well as the market value, provide important information about the financial health of the System.

The current actuarial value of $17.150 billion is $26 million higher than the market value of $17.124 billion, and the actuarial value of assets is approximately 100.2% of the market value.

PROGRESS TOWARD REALIZATION OF FINANCING

The unfunded actuarial accrued liability (UAAL) as of June 30, 2018 was $6.129 billion based on the actuarial value of assets and it increased to $6.530 billion this year. As a result, the System's funded ratio—actuarial value of assets divided by the actuarial accrued liability—decreased from 72.9% to 72.4% as of June 30, 2019. If measured on the market value of assets, the funded ratio would decrease slightly to 72.3%. The decrease from last year was due to several factors including liability losses resulting largely from salaries increasing more than assumed as well as the asset loss mentioned earlier.

BENEFIT PROVISIONS

Our actuarial valuation as of June 30, 2019 reflects the benefit and contribution provisions set forth in current statutes. There were no bills enacted during the 2019 State of Oklahoma legislative session that had an actuarial impact upon the System.

A summary of all major plan provisions contained within this valuation is included in Appendix I of this report.

ASSUMPTIONS AND METHODS

Assumptions are set by the Board of Trustees, taking into account the recommendations of the System's actuary. The System has an experience investigation study performed every fifth year. Except for certain economic assumptions and the election rate for the supplemental medical insurance benefit, the actuarial assumptions used in this valuation are based upon the 2014 Experience Investigation Study Report, dated May 13, 2015, measuring the experience investigation period FY2010 – FY2014. In September 2016, the Board adopted a decrease in the inflation rate from 3.00% to 2.50% resulting in corresponding 0.50% decreases in the investment return (8.00% to 7.50%), the wage inflation (3.75% to 3.25%) and the payroll growth rate (3.25% to 2.75%). In August 2017, the Board adopted a change in the election rate of the supplemental medical insurance benefit. Fifty percent of eligible members who are active or due a deferred vested benefit are assumed to elect the insurance benefit. For annuitants who began receiving a benefit in the year preceding the valuation date, 50% of those not already receiving the benefit are assumed to elect it. The liability for all other annuitants is based on the actual benefit being paid as shown in the data. The current actuarial assumptions were first utilized in the June 30, 2017 actuarial valuation report and there have been no changes since that valuation.

The results of the actuarial valuation are dependent upon the actuarial assumptions used. Actual results can and almost certainly will differ, as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates and funding periods.

We believe the assumptions are internally consistent and are reasonable, based on the actual experience of the System. A summary of the actuarial methods and assumptions incorporated into this valuation is included in Appendix III of this report.

DATA

Member data for retired, active, and inactive participants was supplied as of June 30, 2019 by the System's staff. We have not subjected this data to any auditing procedures, but have examined the data for reasonableness and consistency with the prior year's data. Asset information as of June 30, 2019 was supplied by the auditors and by the System's staff. GRS is not responsible for the accuracy or completeness of the information provided to us.

We wish to sincerely thank the System's entire staff and the System's financial auditors for their assistance in the preparation of our report.

Respectfully submitted,

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SECTION A

EXECUTIVE SUMMARY

Executive Summary

Item	2019	2018
Membership		
• Number of		
- Active members	90,014	88,534
- Retirees and beneficiaries	64,821	63,796
- Inactive, vested	12,784	12,243
- Inactive, nonvested	13,516	13,315
- Total	181,135	177,888
• Payroll	$ 4,592 million	$ 4,223 million
Statutory contribution rates	FY 2020	FY 2019
• Employers in EESIP	9.50%	9.50%
• Regional universities	8.55%	8.55%
• Federal/grant salaries	7.70%	7.70%
• Members	7.00%	7.00%
• State (% of tax revenues)	5.00%	5.00%
Assets		
• Market value	$ 17,124 million	$ 16,629 million
• Actuarial value	$ 17,150 million	$ 16,487 million
• Return on market value	4.9%	9.8%
• Return on actuarial value	6.0%	8.5%
• State/local/federal contributions	$ 819 million	$ 761 million
• External cash flow %	-1.8%	-2.0%
• Ratio of actuarial to market value	100.2%	99.1%
Actuarial Information on Actuarial Value		
• Normal cost %	10.31%	10.34%
• Unfunded actuarial accrued liability (UAAL)	$ 6,530 million	$ 6,129 million
• Funded ratio	72.4%	72.9%
• Funding period (years)	14	14
Actuarial Information on Market Value		
• Unfunded actuarial accrued liability (UAAL)	$ 6,556 million	$ 5,987 million
• Funded ratio	72.3%	73.5%
• Funding period (years)	14	14
Gains/(losses)		
• Asset experience	($248) million	$ 154 million
• Liability experience	(409) million	110 million
• Benefit changes	0 million	0 million
• Legislative Changes	0 million	(18) million
• Assumption Changes	0 million	0 million
• Total	($657) million	$ 246 million

SECTION B

INTRODUCTION

Introduction

The results of the June 30, 2019 actuarial valuation of the Teachers' Retirement System of Oklahoma are presented in this report.

The purposes of any actuarial valuation report are to describe the financial condition of the System, to assess the adequacy of the current contributions, and to analyze changes in the funding requirements.

Section C of our report discusses the determination of the current funding period. Section D analyzes the changes in the unfunded actuarial accrued liability (UAAL). This section also discusses the gains and losses resulting from differences between actual experience and the actuarial assumptions.

Section E of our report details the System's assets as they relate to our actuarial valuation, while Section F discusses the changes in the benefit and contribution provisions since the previous valuation, if any. Section G compares the actual contributions received by the System to an actuarially determined level of contributions. Sections H and I discuss the actuarial assumptions and methods used and the membership data. Section J discusses many of the risks facing the System.

All of the Tables referenced by the other sections appear in Section K of this report.

SECTION C

FUNDED STATUS

Funded Status

Because the employer contribution rates are set by statute, this report determines the funding period required to amortize the Unfunded Actuarial Accrued Liability (UAAL).

The UAAL increased by $0.401 billion, from $6.129 billion as of June 30, 2018 to $6.530 billion as of June 30, 2019. The funded ratio – the ratio of the actuarial value of assets to the actuarial accrued liability – decreased from 72.9% to 72.4% as of June 30, 2019. The decrease from last year was due to several factors including liability losses resulting largely from salaries increasing more than assumed as well as an asset loss. A detailed summary of the changes in UAAL is included in Table 10.

For the fiscal year ending June 30, 2019, the dedicated State revenue plus the matching contribution was equivalent to a contribution rate of approximately 8.3% of covered payroll. Since these contributions are unrelated to the covered payroll of the System, our outlook for the future contribution level from these sources also incorporates the prior four years of actual contributions. As a result, our outlook for the future contribution level is 7.8% of covered payroll. The Initial Funding Surcharge has been excluded from this outlook for future contribution levels since it will only be paid for a temporary period of time.

The employer payroll contribution—9.50% for most employers and 8.55% for the comprehensive and regional universities—is projected to average about 9.3% of payroll, so on a combined basis, we expect that the contributing entities will contribute 17.1% of covered payroll (7.8% + 9.3% = 17.1%) in the future.

Projected Funded Status – 7.5% Return on Market Value of Assets

The funding period – the number of years that would be required under the current contribution schedule to amortize the UAAL – remained 14 years. This determination of funding period assumes that the market value of assets will continue to earn 7.50% per year over that period.

Projections show that it will take about five years for the plan to reach 80% funded (based upon the current contribution and benefit provisions, assuming no actuarial gains or losses in the future, and assuming the market value of assets returns 7.50%).

Projected Funded Status – 7.5% Return on Actuarial Value of Assets

The funding period would also be 14 years if the actuarial value of assets is assumed to earn 7.50% over that period.

As discussed further in Section E, the System currently has $26 million in deferred asset losses that are not currently reflected in the actuarial value of assets. In this situation, assuming that the actuarial value of assets earns 7.50% is essentially assuming that the market value of assets will return slightly more than 7.50% over the period.

There is obviously not one correct answer, as these funding periods will generally differ as often seen in the past. As a result, we have provided this additional funding period calculation to provide the Board with another way to assess the System's funded status.

Actuarially Determined Contributions

This report also determines the Actuarially Determined Employer Contribution (ADEC).

In September 2015, the Board adopted an approach to determining the amortization period for the ADEC. Specifically, the ADEC is determined as the employer contribution amount necessary to discharge the UAAL based on the actuarial value of assets over a period equal to the funding period for the current actuarial valuation (i.e., 14 years as of June 30, 2019). However, in no event shall the amortization period be in excess of a fixed period of twenty (20) years. Since the current funding period based on the actuarial value of assets is 14 years, the ADEC for the 2020 fiscal year is 17.1% of payroll which is equal to the expected employer contribution.

SECTION D

ANALYSIS OF CHANGES

Analysis of Changes

Unfunded Actuarial Accrued Liability (UAAL)

Table 10 of our report shows an analysis of the change in the UAAL. The UAAL, which was $6.129 billion last year, has increased to $6.530 billion this year. The increase in the UAAL was due to several factors including liability losses resulting largely from salaries increasing more than assumed as well as an asset loss discussed in Section E.

Funding Period

As noted in Table 1 under Section K of our report, the funding period (the period required to amortize the UAAL) remained 14 years based on the actuarial value of assets. If all of the actuarial assumptions are met, the funding period is expected to decrease by one year in each successive actuarial valuation. The funding period did not decrease by one year due to the assets on an actuarial value basis returning 6.0% during the year and liability losses.

The funding period on an AVA basis shown in Table 1 of our report, and the projection of the UAAL shown in Table 11, are based upon a deterministic projection that phases in the difference between the actuarial and market values of assets. This projection assumes: (a) future market earnings, net of investment-related expenses, will equal 7.50% per year, (b) there will be no liability gains/losses or changes in assumptions, (c) the number of active members will remain unchanged, (d) active members who leave employment will be replaced by new entrants each year, and (e) employer contributions and dedicated State revenue will remain at approximately 17.1% of payroll each year.

SECTION E

SYSTEM ASSETS

System Assets

This report contains several tables that summarize key information with respect to the System's assets. Assets are reported at market value.

The total market value of assets increased from $16.629 billion to $17.124 billion as of June 30, 2019. This excludes the value of the Teachers' Deposit Fund. (The Teachers' Deposit Fund is the fund that holds the 403(b) plan assets.)

Table 5 reconciles the changes in the fund during the year. Employer contributions increased from $416 million to $447 million. The dedicated State revenue increased from $318 million to $344 million, reflecting increased State tax revenues. Active member contributions increased from $313 million to $326 million, including State credits for contributions.

Table 6 shows the development of the actuarial value of assets. Rather than use the System's market value of assets, the valuation reflects a smoothed asset value. This actuarial value is calculated using a five-year average of the difference between expected and actual earnings on the market value and is meant to dampen the volatility in the funded ratio and the funding period resulting from the year-to-year changes in the market returns. The actuarial value is 100.2% of market value with $26 million in deferred asset losses that have yet to be recognized.

Table 7a provides a calculation of the estimated investment return for the year. As shown, the approximate investment return for FY 2019 is 4.9% when measured on market value and 6.0% when measured on actuarial value. Table 7b shows a history of return rates since FY 2000. The System's ten (10) year and twenty (20) year average annual market returns, net of expenses, are 10.6% and 7.0%, respectively.

Table 8 shows an external cash flow history. External cash flow is a negative 1.8% of assets this year. Table 9a shows the development of the asset loss of $248 million on an actuarial value of assets basis.

SECTION F

BENEFIT AND CONTRIBUTION PROVISIONS

Benefit and Contribution Provisions

Appendix I of our report provides a summary of benefit and contribution provisions of the System, while Appendix II is a historical summary of legislative changes. There were no bills passed in the 2019 legislative session that modified the benefit and contribution provisions of the System.

HB 1023 was passed in the 2018 legislative session which adjusted the minimum teacher salary schedule which was first reflected in the data for the June 30, 2019 valuation. This bill did not change the benefits provided by the System but it did have a sizable impact on the actuarial valuation of the System. The UAAL increased by approximately $440 million due to individual salary increases greater than expected. However, this increase was somewhat offset by lower than expected retirements and larger than expected contributions, which both benefit OTRS, due to the salary increases.

SECTION G

ACTUARIALLY DETERMINED EMPLOYER CONTRIBUTION

Actuarially Determined Employer Contribution (ADEC)

In September 2015, the Board adopted an approach to determining the amortization period for the ADEC. Specifically, the ADEC is determined as the employer contribution amount necessary to discharge the UAAL based on the actuarial value of assets over a period equal to the funding period for the current actuarial valuation (i.e., 14 years as of June 30, 2019). However, in no event shall the amortization period be in excess of a fixed period of twenty (20) years. Since the current funding period based on the actuarial value of assets is 14 years, the ADEC for the 2020 fiscal year is 17.1% of payroll which is equal to the expected employer contribution.

Based on the expected payroll of $4.8 billion for fiscal year 2020, the ADEC is expected to be $818 million.

SECTION H

ACTUARIAL ASSUMPTIONS AND METHODS

Actuarial Assumptions and Methods

Appendix III of our report summarizes the actuarial assumptions used to determine the System's liabilities and the actuarial methods used to determine the normal cost, UAAL and funding period. Except for certain economic assumptions and the election rate for the supplemental medical insurance benefit, the actuarial assumptions used in this valuation are based upon the 2014 Experience Investigation Study Report, dated May 13, 2015, measuring the experience investigation period FY2010 – FY2014. In September 2016, the Board adopted a decrease in the inflation rate from 3.00% to 2.50% resulting in corresponding 0.50% decreases in the investment return (8.00% to 7.50%), the wage inflation (3.75% to 3.25%) and the payroll growth rate (3.25% to 2.75%). In August 2017, the Board adopted a change in the election rate of the supplemental medical insurance benefit which was first used in the June 30, 2017 valuation.

Since the prior valuation, there have been no changes to the assumptions or methods.

SECTION I

MEMBERSHIP DATA

Membership Data

Data on all members of the System, whether active, receiving a benefit, or entitled to a future benefit, was supplied by the System.

We did not verify the correctness of the data at the source, but we did perform various tests to ensure the internal consistency of the data and its overall reasonableness. In our review of this data we encountered a small number of records with missing or inconsistent information. We made adjustments to these records, but this did not materially impact the results shown.

Item V of Appendix III of our report provides more detail about the processing of membership data for valuation purposes.

Tables 4a and 4b show some key statistics for the various groups included and Table 13 shows the distribution of active members by age and service.

There was a 1.7% increase in the number of active members since the previous valuation and an 8.7% increase in the payroll for active members based on the data provided.

Membership has increased slightly over both the last five and ten year periods. Payroll for covered members has grown an average of 2.8% over the last five and 1.9% over the last ten years.

Over the last decade, the active group has slowly gotten older. As shown in Table 4b, the average active member is now 46.1 years old and the average age for the active group has increased 0.1 years during the last ten years. During the same period, the average tenure of members has decreased 0.5 years.

SECTION J

RISK ASSESSMENT

Risk Assessment

Risks Associated with Measuring the Actuarial Accrued Liability and Actuarially Determined Employer Contribution

The determination of the actuarial accrued liability and the actuarially determined employer contribution (ADEC) requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the actuarially determined contribution that result from the differences between actual experience and the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report 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 due to changing conditions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period, or additional cost or contribution requirements based on the System's funded status); and changes in plan provisions or applicable law. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the System's future financial condition include:

1. Investment risk – actual investment returns may differ from the expected returns;
2. Asset/Liability mismatch – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. Contribution risk – actual contributions may differ from expected future contributions. For example, actual contributions from the State may not be made in accordance with the current arrangement or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. Salary and Payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. Longevity risk – members may live longer or shorter than expected and receive pensions for a period of time other than assumed;
6. Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

Risk Assessment (Continued)

The ADEC discussed in Section G may be considered as a minimum contribution that complies with the Board's funding policy and State statute. The timely receipt of the ADEC is critical to support the financial health of the System. Users of this report should be aware that contributions made consistent with the ADEC do not necessarily guarantee benefit security.

Plan Maturity Measures

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures include the following:

	2019	**2018**	**2017**
Ratio of the market value of assets to total payroll	3.73	3.94	3.76
Ratio of actuarial accrued liability to payroll	5.16	5.36	5.36
Ratio of actives to retirees and beneficiaries	1.4	1.4	1.4
Ratio of net cash flow to market value of assets	-1.8%	-2.0%	-2.3%
Duration of the actuarial accrued liability	11.7	11.5	11.6

Ratio of Market Value of Assets to Payroll

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 2.0 times the payroll, a return on assets 5% different than assumed would equal 10% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

Ratio of Actuarial Accrued Liability to Payroll

The ratio of liability to payroll may be used as a measure of sensitivity of the liability itself. For example, if the actuarial accrued liability is 2.5 times the payroll, a change in liability 2% other than assumed would equal 5% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

Ratio of Actives to Retirees and Beneficiaries

A young plan with many active members and few retirees will have a high ratio of active to retirees. A mature open plan may have close to the same number of actives to retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

Risk Assessment (Continued)

Ratio of Net Cash Flow to Market Value of Assets

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means existing funds are being used to make payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

Duration of Actuarial Accrued Liability

The duration of the actuarial accrued liability may be used to approximate the sensitivity to a 1% change in the assumed rate of return. For example, duration of 10 indicates that the liability would increase approximately 10% if the assumed rate of return were lowered 1%.

Additional Risk Assessment

Additional risk assessment is outside the scope of the annual actuarial valuation. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability.

SECTION K

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Table 1

Development of Employer Cost

	June 30, 2019	June 30, 2018
1. Payroll		
a. Supplied by System (annualized)	$ 4,591,955,376	$ 4,223,226,379
b. Adjusted for one year's pay increase	4,784,059,765	4,400,449,611
2. Normal cost rate		
a. Total normal cost rate	10.21%	10.24%
b. Administrative expenses	0.10%	0.10%
c. Less: member rate	-7.00%	-7.00%
d. Employer normal cost rate	3.31%	3.34%
3. Actuarial accrued liability for active members		
a. Present value of future benefits for active members	$ 13,383,999,075	$ 12,323,877,313
b. Less: present value of future employer normal costs	(1,069,306,149)	(992,667,185)
c. Less: present value of future member contributions	(2,590,430,281)	(2,385,041,542)
d. Actuarial accrued liability	$ 9,724,262,645	$ 8,946,168,586
4. Total actuarial accrued liability for:		
a. Retirees and beneficiaries	$ 13,205,728,894	$ 12,973,175,337
b. Inactive members	750,211,322	696,542,764
c. Active members (Item 3d)	9,724,262,645	8,946,168,586
d. Total	$ 23,680,202,861	$ 22,615,886,687
5. Actuarial value of assets	$ 17,150,348,067	$ 16,486,871,824
6. Unfunded actuarial accrued liability (UAAL) (Item 4d - Item 5)	$ 6,529,854,794	$ 6,129,014,863
7. Funding period based on statutory contributions (years)		
a. With assumed rate of return on the actuarial value of assets	14	14
b. With assumed rate of return on the market value of assets	14	14

Table 2

Actuarial Present Value of Future Benefits

		June 30, 2019	June 30, 2018
1.	Active members		
	a. Service retirement benefits	$ 11,980,538,461	$ 11,005,850,040
	b. Deferred termination benefits	702,889,266	213,361,425
	c. Refunds	58,184,270	495,134,427
	d. Death benefits	170,870,170	160,328,287
	e. Disability retirement benefits	261,463,001	240,356,801
	f. Supplemental medical insurance	178,654,826	177,795,327
	g. $5,000 post-retirement death benefit	31,399,081	31,051,006
	h. Total	$ 13,383,999,075	$ 12,323,877,313
2.	Retired members		
	a. Service retirements	$ 12,189,147,146	$ 11,959,572,744
	b. Disability retirements	182,358,884	180,251,560
	c. Beneficiaries	467,767,827	440,757,483
	d. Supplemental medical insurance	251,515,971	262,294,315
	e. $5,000 post-retirement death benefit	114,939,066	111,888,298
	f. One-time stipend payment	0	18,410,937
	g. Total	$ 13,205,728,894	$ 12,973,175,337
3.	Inactive members		
	a. Vested terminations	$ 631,195,815	$ 586,395,972
	b. Nonvested terminations	63,335,786	59,682,252
	c. Suspense fund	55,679,721	50,464,540
	d. Total	$ 750,211,322	$ 696,542,764
4.	Total actuarial present value of future benefits	$ 27,339,939,291	$ 25,993,595,414

Note: The present value of benefits was reallocated between "deferred termination benefits" and "refunds" in the table above for presentation purposes but the combined cost for these two termination benefits was unchanged.

Table 3

Analysis of Normal Cost

		June 30, 2019	June 30, 2018
1.	Gross normal cost rate		
	a. Retirement benefits	7.26%	7.30%
	b. Deferred termination benefits	1.67%	0.49%
	c. Refunds	0.72%	1.88%
	d. Supplemental medical insurance	0.13%	0.14%
	e. $5,000 Post-retirement death benefits	0.03%	0.03%
	f. Death Benefits	0.16%	0.16%
	g. Disability retirement benefits	0.24%	0.24%
	h. Total	10.21%	10.24%
2.	Administrative expenses	0.10%	0.10%
3.	Less: member rate	7.00%	7.00%
4.	Employer normal cost rate	3.31%	3.34%

Note: The normal cost was reallocated between “deferred termination benefits” and “refunds” in the table above for presentation purposes but the combined cost for these two termination benefits was unchanged.

Table 4A

Membership Data

		June 30, 2019 (1)	June 30, 2018 (2)
1.	Active members		
	a. Number	90,014	88,534
	b. Total payroll supplied by System (annualized)	$ 4,591,955,376	$ 4,223,226,379
	c. Average salary	$ 51,014	$ 47,702
	d. Average age	46.1	46.0
	e. Average service	11.0	11.1
2.	Vested inactive members		
	a. Number	12,784	12,243
	b. Total annual deferred benefits[1]	$ 103,748,647	$ 97,532,879
	c. Average annual deferred benefit	$ 8,116	$ 7,966
3.	Nonvested inactive members		
	a. Number	13,516	13,315
	b. Member contributions with interest due	$ 63,335,786	$ 59,682,252
	c. Average refund due	$ 4,686	$ 4,482
4.	Service retirees		
	a. Number	59,517 [2]	58,680
	b. Total annual benefits[1]	$ 1,274,030,504	$ 1,241,745,971
	c. Average annual benefit	$ 21,406	$ 21,161
5.	Disabled retirees		
	a. Number	1,713	1,712
	b. Total annual benefits[1]	$ 20,718,221	$ 20,470,572
	c. Average annual benefit	$ 12,095	$ 11,957
6.	Beneficiaries and spouses		
	a. Number	3,591	3,404
	b. Total annual benefits[1]	$ 61,599,381	$ 57,726,584
	c. Average annual benefit	$ 17,154	$ 16,958

[1] Benefit amounts exclude the supplemental medical insurance payment.

[2] Includes one special retiree with an annual benefit of $2,339.

Table 4B

Historical Summary of Active Member Data

Valuation as of June 30,	Active Members: Number	Active Members: Percent Increase	Covered Payroll: Amount in $ Millions	Covered Payroll: Percent Increase	Average Salary: $ Amount	Average Salary: Percent Increase	Average Age	Average Service
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2000	83,024	1.4%	$2,738	3.4%	$32,982	1.9%	44.5	11.0
2001	84,387	1.6%	2,991	9.2%	35,438	7.4%	44.7	11.0
2002	85,366	1.2%	3,047	1.9%	35,695	0.7%	44.9	11.1
2003	83,127	-2.6%	3,046	0.0%	36,639	2.6%	45.3	11.5
2004	81,683	-1.7%	3,031	-0.5%	37,104	1.3%	45.6	11.8
2005	84,286	3.2%	3,175	4.8%	37,671	1.5%	45.6	11.6
2006	87,194	3.5%	3,355	5.7%	38,476	2.1%	45.7	11.6
2007	88,133	1.1%	3,599	7.3%	40,835	6.1%	45.8	11.5
2008	88,678	0.6%	3,751	4.2%	42,304	3.6%	45.9	11.5
2009	89,388	0.8%	3,808	1.5%	42,600	0.7%	46.0	11.5
2010	89,896	0.6%	3,855	1.2%	42,880	0.7%	46.0	11.5
2011	88,085	-2.0%	3,773	-2.1%	42,837	-0.1%	46.2	11.7
2012	87,778	-0.3%	3,925	4.0%	44,713	4.4%	46.2	11.6
2013	89,333	1.8%	3,933	0.2%	44,027	-1.5%	46.1	11.4
2014	89,570	0.3%	4,003	1.8%	44,690	1.5%	45.9	11.2
2015	90,388	0.9%	4,232	5.7%	46,819	4.8%	45.8	11.0
2016	90,167	-0.2%	4,255	0.5%	47,188	0.8%	45.8	11.0
2017	87,795	-2.6%	4,116	-3.3%	46,878	-0.7%	46.0	11.1
2018	88,534	0.8%	4,223	2.6%	47,702	1.8%	46.0	11.1
2019	90,014	1.7%	4,592	8.7%	51,014	6.9%	46.1	11.0

Table 5

Reconciliation of Plan Net Assets

	Year Ending	
	June 30, 2019	June 30, 2018
	(1)	(2)
1. Market value of assets at beginning of year, net of Deposit Fund		
a. Value reported in prior valuation	$ 16,629,128,955	$ 15,463,333,297
b. Prior period adjustments	(1)	0
c. Revised value	$ 16,629,128,954	$ 15,463,333,297
2. Revenue for the year		
a. Contributions		
i. Member contributions, including state credit	$ 325,766,148	$ 312,866,576
ii. Grant matching funds	27,969,601	26,437,350
iii. State contribution	343,701,556	318,172,751
iv. Employer/district contributions	447,039,679	415,981,030
v. Total	$ 1,144,476,984	$ 1,073,457,707
b. Net investment earnings		
i. Investment Income	$ 876,621,617	$ 1,570,536,606
ii. Investment expenses	(68,304,746)	(70,170,333)
iii. Net investment earnings	$ 808,316,871	$ 1,500,366,273
c. Total revenue	$ 1,952,793,855	$ 2,573,823,980
3. Expenditures for the year		
a. Refunds	38,002,018	$ 42,940,983
b. Benefit payments, including insurance payments	1,414,686,012	1,360,875,891
c. Administrative expenses	5,198,970	4,211,448
d. Total expenditures	1,457,887,000	$ 1,408,028,322
4. Increase in net assets (Item 2 - Item 3)	$ 494,906,855	$ 1,165,795,658
5. Market value of assets at end of year, net of Deposit Fund (Item 1 + Item 4)	$ 17,124,035,809	$ 16,629,128,955

Table 6

Development of Actuarial Value of Assets

		Year Ending June 30, 2019
1.	Market value of assets at beginning of year (prior to adjustments)	$ 16,629,128,955
2.	Net new investments	
	a. Contributions	$ 1,144,476,984
	b. Expenditures	(1,457,887,000)
	c. Subtotal	(313,410,016)
3.	Market value of assets at end of year	$ 17,124,035,809
4.	Net earnings (3-1-2)	$ 808,316,870
5.	Assumed investment return rate	7.50%
6.	Expected return	$ 1,235,431,796
7.	Excess return (4-6)	$ (427,114,926)

8. Excess return on assets for last four years :

	Period End (1)	Excess Return (2)	Percent Deferred (3)	Deferred Amount (4)
a.	June 30, 2016	(1,453,790,691)	20%	$ (290,758,138)
b.	June 30, 2017	985,600,542	40%	394,240,217
c.	June 30, 2018	353,162,674	60%	211,897,604
d.	June 30, 2019	(427,114,926)	80%	(341,691,941)
				$ (26,312,258)

9.	Actuarial value of assets (Item 3 - Item 8)	$ 17,150,348,067
10.	Actuarial value as percentage of market value	100.2%

Table 7A

Estimation of Yields

		Year Ending	
		June 30, 2019	June 30, 2018
		(1)	(2)
A.	Market value yield		
1.	Beginning of year market assets (prior to adjustments)	$ 16,629,128,955	$ 15,463,333,297
2.	Net investment income (including realized and unrealized gains and losses)	$ 808,316,870	$ 1,500,366,273
3.	End of year market assets	$ 17,124,035,809	$ 16,629,128,955
4.	Estimated dollar weighted market value yield	4.9%	9.8%
B.	Actuarial value yield		
1.	Beginning of year actuarial assets	$ 16,486,871,824	$ 15,516,340,027
2.	Actuarial return	$ 976,886,259	$ 1,305,102,412
3.	End of year actuarial assets	$ 17,150,348,067	$ 16,486,871,824
4.	Estimated actuarial value yield	6.0%	8.5%

Table 7B

History of Investment Return Rates

Year Ending June 30 of	Market	Actuarial
(1)	(2)	(3)
2000	10.5%	15.5%
2001	-2.3%	11.4%
2002	-5.4%	5.8%
2003	4.8%	2.9%
2004	20.2%	4.6%
2005	10.0%	5.7%
2006	9.4%	8.2%
2007	18.0%	12.4%
2008	-7.5%	9.4%
2009	-16.2%	2.0%
2010	16.1%	1.7%
2011	22.7%	5.0%
2012	1.3%	3.3%
2013	17.3%	7.9%
2014	22.1%	15.6%
2015	2.7%	13.1%
2016	-2.2%	8.0%
2017	14.7%	9.0%
2018	9.8%	8.5%
2019	4.9%	6.0%
Average Returns		
Last Five Years:	5.8%	8.9%
Last Ten Years:	10.6%	7.7%
Last Fifteen Years:	7.6%	7.7%
Last Twenty Years:	7.0%	7.7%

Table 8

History of Cash Flow

Year Ending June 30,	Contributions	Distributions and Expenditures: Benefit Payments	Refunds	Administrative Expenses	Total	External Cash Flow for the Year[1]	Market Value of Assets	External Cash Flow as Percent of Market Value
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2010	910.9	(912.9)	(30.4)	(5.0)	(948.3)	(37.4)	8,352	-0.4%
2011	925.1	(969.3)	(35.2)	(4.7)	(1,009.2)	(84.1)	10,156	-0.8%
2012	973.0	(1,036.1)	(32.1)	(4.3)	(1,072.5)	(99.5)	10,195	-1.0%
2013	991.0	(1,095.1)	(28.9)	(4.2)	(1,128.2)	(137.2)	11,810	-1.2%
2014	1,008.4	(1,153.1)	(28.7)	(4.3)	(1,186.1)	(177.7)	14,229	-1.2%
2015	1,032.1	(1,201.4)	(35.2)	(4.4)	(1,241.0)	(208.9)	14,405	-1.5%
2016	1,019.9	(1,257.3)	(36.1)	(4.5)	(1,297.9)	(278.0)	13,814	-2.0%
2017	998.2	(1,312.1)	(40.9)	(4.1)	(1,357.1)	(358.9)	15,463	-2.3%
2018	1,073.5	(1,360.9)	(42.9)	(4.2)	(1,408.0)	(334.5)	16,629	-2.0%
2019	1,144.5	(1,414.7)	(38.0)	(5.2)	(1,457.9)	(313.4)	17,124	-1.8%

Dollar amounts in millions

[1] Column (7) = Column (2) + Column (6).

Table 9A

Investment Experience Gain or Loss

Item	Year Ending June 30, 2019	Year Ending June 30, 2018
(1)	(2)	(3)
1. Actuarial assets, beginning of year	$ 16,486,871,824	$ 15,516,340,027
2. Contributions during year	$ 1,144,476,984	$ 1,073,457,707
3. Benefits and refunds paid	$ (1,452,688,030)	$ (1,403,816,874)
4. Administrative expenses	$ (5,198,970)	$ (4,211,448)
5. Assumed net investment income at 7.5%:		
a. Beginning of year assets	$ 1,236,515,387	$ 1,163,725,502
b. Contributions	42,917,887	40,254,664
c. Benefits and refunds paid	(54,475,801)	(52,643,133)
d. Administrative expenses	(194,961)	(157,929)
e. Total	$ 1,224,762,512	$ 1,151,179,104
6. Expected actuarial assets, end of year (Sum of Items 1 through 5)	$ 17,398,224,320	$ 16,332,948,516
7. Actual actuarial assets, end of year	$ 17,150,348,067	$ 16,486,871,824
8. Asset gain (loss) for year (Item 7 - Item 6)	$ (247,876,253)	$ 153,923,308

Table 9B

Total Experience Gain or Loss

Item	Year Ending June 30, 2019	Year Ending June 30, 2018
(1)	(2)	(3)
A. Calculation of total actuarial gain or loss		
1. Unfunded actuarial accrued liability (UAAL), previous year	$ 6,129,014,863	$ 6,537,808,023
2. Normal cost for the year (including admin expenses)	$ 455,006,490	$ 443,310,937
3. Less: total contributions for the year	$ (1,144,476,984)	$ (1,073,457,707)
4. Interest at 7.5%:		
a. On UAAL	$ 459,676,115	$ 490,335,602
b. On normal cost	17,062,743	16,624,160
c. On contributions	(42,917,887)	(40,254,664)
d. Total	$ 433,820,971	$ 466,705,098
5. Expected UAAL (Sum of Items 1 through 4)	$ 5,873,365,340	$ 6,374,366,351
6. Actual UAAL	$ 6,529,854,794	$ 6,129,014,863
7. Total gain (loss) for the year (Item 5 - Item 6)	$ (656,489,454)	$ 245,351,488
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ (247,876,253)	$ 153,923,308
9. Liability gain (loss) for the year	(408,613,201)	109,839,117
10. Ad hoc COLA granted different than assumed	0	0
11. Impact of changes in actuarial assumptions and methods	0	0
12. Impact of legislative changes	0	(18,410,937)
13. Total gain (loss)	$ (656,489,454)	$ 245,351,488

Table 10

Analysis of Change in Unfunded Actuarial Accrued Liability (UAAL)

Basis (1)	June 30, 2019 UAAL (in $ Millions) (2)	June 30, 2018 UAAL (in $ Millions) (3)
1. From prior valuation	$ 6,129.0	$ 6,537.8
2. Impact of changes, gains and losses		
a. Expected increase based on expected contributions and passage of time	(164.0)	(117.3)
b. Liability (gain)/loss	408.6	(109.8)
c. Asset (gain)/loss	247.9	(153.9)
d. Impact of actual contributions (more)/less than expected under schedule	(91.6)	(46.2)
e. Ad hoc COLA granted different than assumed	0.0	0.0
f. Impact of changes in actuarial assumptions and methc	0.0	0.0
g. Legislative changes	0.0	18.4
h. Total	400.9	(408.8)
3. Current UAAL (1+2h)	$ 6,529.9	$ 6,129.0

Columns may not total due to rounding

Table 11

Projection of UAAL

Valuation Date (1)	UAAL (Millions) (2)
June 30, 2019	$ 6,529.9
June 30, 2020	6,435.4
June 30, 2021	6,022.3
June 30, 2022	5,771.6
June 30, 2023	5,553.4
June 30, 2024	5,207.4
June 30, 2025	4,815.1
June 30, 2026	4,372.4
June 30, 2027	3,875.3
June 30, 2028	3,319.0
June 30, 2029	2,698.7
June 30, 2030	2,008.5
June 30, 2031	1,242.3
June 30, 2032	393.5
June 30, 2033	(545.2)

Projection assumes that: (a) future market earnings, net of investment-related expenses, will equal 7.50% per year, (b) there will be no liability gains/losses or changes in assumptions, (c) the number of active members will remain unchanged, (d) active members who leave employment will be replaced by new entrants each year, and (e) employer and State contributions will remain the same percentage of payroll as projected for the current fiscal year.

Table 12

Solvency Test

Actuarial Accrued Liability and Percent of Active Member Payroll for:

	Accumulated Member Contributions Including Interest		Retirees and Beneficiaries Currently Receiving Benefits		Terminated Employees Not Yet Receiving Benefits		Employer Financed Portion of Vested and Nonvested Benefits			Portion of Accrued Liabilities Covered by Assets			
June 30,	(1)	% of Payroll	(2)	% of Payroll	(3)	% of Payroll	(4)	% of Payroll	Actuarial Value of Assets	(1)	(2)	(3)	(4)
2010	$ 4,743.9	123%	$ 10,216.3	265%	$ 419.2	11%	$ 4,601.2	119%	$ 9,566.7	100%	47%	0%	0%
2011	4,931.4	131%	9,316.6	247%	379.9	10%	2,932.9	78%	9,960.6	100%	54%	0%	0%
2012	5,087.4	130%	9,814.2	250%	443.8	11%	3,242.6	83%	10,190.5	100%	52%	0%	0%
2013	5,252.6	134%	10,315.6	262%	469.3	12%	2,935.7	75%	10,861.1	100%	54%	0%	0%
2014	5,221.1	130%	10,780.2	269%	726.8	18%	2,847.5	71%	12,369.0	100%	66%	0%	0%
2015	5,377.9	127%	11,499.9	272%	534.3	13%	3,280.5	78%	13,771.9	100%	73%	0%	0%
2016	5,494.8	129%	12,466.8	293%	610.9	14%	3,620.7	85%	14,577.9	100%	73%	0%	0%
2017	5,572.8	135%	12,602.9	306%	651.1	16%	3,227.3	78%	15,516.3	100%	79%	0%	0%
2018	5,736.4	136%	12,973.2	307%	696.5	16%	3,209.8	76%	16,486.9	100%	83%	0%	0%
2019	6,011.2	131%	13,205.7	288%	750.2	16%	3,713.1	81%	17,150.3	100%	84%	0%	0%

Note: Dollar amounts in millions

Table 13

Distribution of Active Members by Age and by Years of Service

	Years of Credited Service												
	0	1	2	3	4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over	Total
Attained Age	Count & Avg. Comp	Count & Avg. Comp	Count & Avg. Comp	Count & Avg. Comp	Count & Avg. Comp	Count & Avg. Comp	Count & Avg. Comp	Count & Avg. Comp	Count & Avg. Comp.	Count & Avg. Comp	Count & Avg. Comp	Count & Avg. Comp	Count & Avg. Comp
Under 25	304	1,130	330	41	17	7	0	0	0	0	0	0	1,829
	$40,184	$38,246	$37,608	$29,954	$23,912	$27,759	$0	$0	$0	$0	$0	$0	$38,094
25-29	299	2,126	1,589	1,182	1,010	1,170	3	0	0	0	0	0	7,379
	$40,172	$39,969	$40,956	$40,926	$41,847	$42,303	$43,724	$0	$0	$0	$0	$0	$40,972
30-34	212	1,431	934	730	841	3,880	732	1	0	0	0	0	8,761
	$43,724	$42,455	$43,664	$42,809	$42,623	$45,987	$49,598	$43,657	$0	$0	$0	$0	$44,821
35-39	206	1,377	897	776	779	2,998	3,243	592	1	0	0	0	10,869
	$47,178	$43,486	$43,914	$44,310	$45,399	$48,374	$51,577	$54,573	$75,257	$0	$0	$0	$48,156
40-44	189	1,146	823	665	658	2,550	2,368	2,428	524	2	0	0	11,353
	$44,082	$42,761	$42,824	$44,199	$45,073	$47,154	$53,040	$58,507	$62,268	$49,586	$0	$0	$50,406
45-49	146	1,000	619	569	535	2,412	2,286	2,027	2,570	509	3	0	12,676
	$45,469	$43,682	$44,229	$41,720	$45,642	$46,008	$52,073	$60,442	$64,286	$69,123	$73,729	$0	$53,566
50-54	136	781	485	444	435	1,876	1,987	1,780	1,725	2,005	379	2	12,035
	$44,437	$44,427	$42,933	$42,316	$42,742	$45,219	$49,173	$60,237	$64,618	$68,571	$68,866	$49,657	$55,160
55-59	144	712	449	389	400	1,729	1,831	1,756	1,712	1,358	1,082	257	11,819
	$47,887	$42,705	$41,350	$40,555	$40,653	$44,361	$48,248	$54,975	$62,457	$68,887	$72,098	$71,829	$54,694
60-64	72	409	330	255	269	1,235	1,260	1,199	1,349	1,006	550	710	8,644
	$45,133	$40,716	$40,254	$41,130	$41,933	$44,756	$46,842	$56,371	$59,757	$66,654	$77,586	$75,427	$55,614
65 & Over	48	276	188	171	182	779	709	557	507	464	325	443	4,649
	$40,873	$39,361	$38,994	$35,596	$38,571	$41,858	$47,092	$57,004	$63,911	$68,072	$76,741	$94,019	$56,268
Total	1,756	10,388	6,644	5,222	5,126	18,636	14,419	10,340	8,388	5,344	2,339	1,412	90,014
	$43,472	$41,792	$42,187	$42,035	$43,136	$45,813	$50,406	$58,029	$63,105	$68,292	$73,512	$80,569	$51,014

APPENDIX I

SUMMARY OF PLAN PROVISIONS

APPENDIX I
Summary of Plan Provisions

1. Effective Date: July 1, 1943.

2. Plan Year: Twelve-month period ending June 30th.

3. Administration: The Teachers' Retirement System of Oklahoma is administered by a Board of Trustees, which is responsible for administration of the System and investment of System assets. Four members serve ex officio, while a total of ten others are appointed by the Governor (six), the President of the Senate (two), and the Speaker of the House (two), according to various guidelines. Additionally, a statewide organization representing retired educators shall appoint a member to the Board who shall be a nonvoting member.

4. Type of Plan: The System is a qualified governmental defined benefit retirement plan. For GASB purposes, it is a cost-sharing multiple-employer plan.

5. Eligibility: All employees of any public school in Oklahoma, including public colleges and universities, are eligible to participate in the System. Classified personnel (teachers, supervisors, principals, registered school nurses, administrators, etc.) are required to participate, beginning at their date of employment. Non-classified employees (all other employees, such as drivers, secretaries, janitors, cooks, etc.) may, but are not required to, participate. Certain other State employees, such as employees of the System itself, participate in the System. Beginning July 1, 2004, new employees hired by the comprehensive universities (Oklahoma University, the Health Sciences Center, and Oklahoma State University) may elect to join an alternate plan provided by the universities in lieu of joining OTRS. The election to join the alternate plan is irrevocable.

6. Maximum Pay: Prior to July 1, 1995, contributions under this System were based on pay up to a maximum dollar amount. Members could choose between a $40,000 maximum and a $25,000 maximum. The member's Final Average Compensation was limited by this same maximum, so the member's election affected both benefits and contributions.

   The maximum was removed for most members effective July 1, 1995. It no longer applies in determining the required member and employer contributions. It does still have an impact, however. As noted below, benefits based on service earned before July 1, 1995 are limited by the $40,000 or $25,000 maximum, whichever was elected. This cap may be modified for members in the Education Employees Service Incentive Plan (EESIP). See Item 22 below discussing the EESIP provisions.

   In addition, the cap on salary continued to apply after June 30, 1995 to members employed by one of the comprehensive universities who entered the System before July 1, 1995. The cap on salary for contribution purposes is shown in the schedule below. All caps were removed effective July 1, 2007.

APPENDIX I (Continued)

	Elected $40,000 Maximum	Elected $25,000 Maximum
1995/1996	$44,000	$27,500
1996/1997	49,000	32,500
1997/1998	54,000	37,500
1998/1999	59,000	42,500
1999/2000	59,000	42,500
2000/2001	64,000	47,500
2001/2002	69,000	52,500
2002/2003	74,000	57,500
2003/2004	79,000	62,500
2004/2005	84,000	67,500
2005/2006	89,000	72,500
2006/2007	94,000	77,500
Thereafter	No limit	No limit

Benefits for the members employed by the comprehensive universities, except for those hired on or after July 1, 1995, are limited by the pay caps for the period before July 1, 2007.

7. Member Contributions: Generally, active members contribute 7.00% of all compensation to the System. A school district may pay all or part of the contribution for its employees.

8. Employer Contributions: Employers are required to contribute a fixed percentage of pay on behalf of active members. The employer contribution rate is now applied to all pay, although historically the rate was not applied to pay above the cap on salary.

   The employer contribution rate for years from July 1, 2002 through December 31, 2006 was 7.05% of covered salary. Effective January 1, 2007, the employer contribution rate paid by all employers covered by the EESIP increased to 7.60%. This rate then increased to 7.85% effective July 1, 2007, 8.35% effective January 1, 2008, 8.50% effective July 1, 2008, 9.00% effective January 1, 2009, and 9.50% effective January 1, 2010. For employers not covered by the EESIP—the comprehensive and regional four-year universities—the rate increased to 7.55% effective January 1, 2008, 8.05% effective January 1, 2009, and 8.55% effective January 1, 2010.

   In addition, the State of Oklahoma contributes 5.00% percent of revenues from sales taxes, use taxes, corporate income taxes and individual income taxes. The 5.00% rate became effective on July 1, 2007. The rates are shown in the following schedule on the next page.

APPENDIX I (Continued)

Fiscal Year	State Contribution Percentage
FY 2003	3.54%
FY 2004	3.54%
FY 2005	3.75%
FY 2006	4.00%
FY 2007	4.50%
FY 2008	5.00%
Thereafter	5.00%

Beginning in FY 2006, the State also contributes 5.00% of lottery proceeds.

If a member's salary is paid from federal funds or certain grant money, an additional contribution (the grant matching contribution) is required. The matching contribution rate is set by the Board of Trustees annually and is expressed as a percentage of federal/grant salaries.

Fiscal Year	Federal/Grant Contribution Percentage
FY 2003	5.00%
FY 2004 to 2005	4.50%
FY 2006	5.00%
FY 2007 to 2008	7.00%
FY 2009 to 2010	7.50%
FY 2011	6.50%
FY 2012	7.00%
FY 2013	8.00%
FY 2014 to 2016	8.25%
FY 2017	7.70%
FY 2018	7.80%
FY 2019 to 2020	7.70%

9. Service: Employees receive credit for a year of service if they are contributing members for at least six months within one school year. For service performed on or after July 1, 2013, fractional service will be awarded for less than full-time employment performed during the contract year. Fractional service credit will be added together and the resulting sum will be included in the retirement formula calculations. For service performed on or after July 1, 2016 service credit awarded for all members will be the result of the days the employee worked during the employment year divided by the days the full-time equivalent for that position would be required to work during the entire employment year.

   Credit may also be granted for service prior to the System's effective date, and non-classified employees can purchase credit for their prior service once they have joined the System. Credit is also available for some out-of-state and military service under certain circumstances.

   Finally, members receive a year of service credit if they have accumulated 120 days of unused sick leave at termination. As of August 1, 2012, if a member has less than 120 days of unused sick leave at termination, additional service credit for sick leave days shall be equal to the number of unused sick leave days divided by 120 days.

APPENDIX I (Continued)

10. Final Average Compensation (FAC): The average of the member's compensation for the three or five years on which the highest contributions are paid. For persons becoming members before July 1, 1992, the averaging period is three years. For other members, the averaging period is five years. For service prior to July 1, 1995, the FAC is limited to $40,000 or $25,000, depending on the member's election and participation in the EESIP as discussed in Item 6 above and in Item 22.

11. Normal Retirement

    a. Eligibility: A member is eligible to retire and receive a Normal Retirement benefit if (i) the member is at least age 62 and has credit for five or more years of service, or (ii) the sum of the member's age and service is at least 80 (Rule of 80). For members joining after June 30, 1992, a "Rule of 90" is used instead of the "Rule of 80". Members joining after October 31, 2011 are eligible if (i) the member is at least age 65 and has credit for five or more years of service, or (ii) the member is at least age 60 and meets the "Rule of 90". Members joining after October 31, 2017 must have credit for seven or more years of service.

    b. Monthly Benefit: 2% of FAC (limited to $40,000 or $25,000, as appropriate) times years of service prior to July 1, 1995, plus 2% of FAC (unlimited) times years of service after June 30, 1995. Special provisions apply to members covered by the EESIP (see Item 22 below). Other special provisions apply to higher education members for service during the period July 1, 1995 through June 30, 2007 if their pay in any year in this period exceeded the applicable maximum. Monthly benefits are equal to one-twelfth of the calculated amount.

    c. Payment Form: Benefits are paid as a monthly life annuity, with a guarantee that if the payments made do not exceed the member's accumulated contributions, determined as of the date of retirement, the balance will be paid in a lump-sum to the member's beneficiary. This payment form is referred to as the "Maximum Option" since it initially provides the largest annuity. Optional forms of payment are available; see below.

12. Early Retirement

    a. Eligibility: A member is eligible to retire early if the member is at least age 55 and has credit for five or more years of service, or at any age after 30 years of service. For members joining after October 31, 2011, a member is eligible to retire early if the member is at least age 60 and has credit for five or more years of service. Members joining after October 31, 2017 must have credit for seven or more years of service.

    b. Monthly Benefit: The Normal Retirement benefit (based on current years of service) multiplied by the applicable early retirement factor below.

APPENDIX I (Continued)

c. Early Retirement Factor:

Retirement Age	Actuarial Equivalent Factors for Members Joining before November 1, 2011*	Statutory Factors for Members Joining after October 31, 2011
65 or later	1.000000	1.00
64	1.000000	0.93
63	1.000000	0.86
62	1.000000	0.80
61	0.913529	0.73
60	0.835549	0.65
59	0.765083	N/A
58	0.701285	N/A
57	0.643419	N/A
56	0.590845	N/A
55	0.543003	N/A
54	0.499406	N/A
53	0.459624	N/A
52	0.423278	N/A
51	0.390033	N/A
50	0.359593	N/A

* Reduction factors will change as the System's definition of Actuarial Equivalence changes. Factors stated here were communicated to the System in 2018.

d. Payment Form: Same as for Normal Retirement above**.**

13. Disability Retirement

a. Eligibility: A member is eligible provided (i) he/she has credit for at least 10 years of service and (ii) the disability is either approved by the Medical Board appointed by the Board of Trustees, or the member is determined to be eligible for disability benefits pursuant to the Social Security System.

b. Monthly Benefit: Same as for Normal Retirement above (based on current service).

c. Payment Form: The disability benefit commences immediately upon the member's retirement. Benefits are reduced or cease entirely upon recovery or reemployment prior to age 60. Disability benefits are payable as a monthly life annuity, with a guarantee that if the payments made do not exceed the sum of the member's accumulated contributions as of the date of retirement, the balance will be paid in a lump-sum to the member's beneficiary. A married, disabled member may elect a reduced benefit under the Joint & 100% Survivor option (with pop up) form of payments (Option 2 described in Item 17 below).

14. Vested Termination Benefit

a. Eligibility: A member with at least 5 years of service who does not withdraw his/her contributions from the fund is eligible for a vested termination benefit. Members joining after October 31, 2017 must have credit for seven or more years of service.

b. Monthly Benefit: Same as for Normal Retirement above (based on current service). If benefits commence prior to age 62 (age 65 for members joining after October 31, 2011), they may be reduced for Early Retirement above.

c. Payment Form: Same as for Normal Retirement above.

15. Withdrawal (Refund) Benefit

a. Eligibility: All members leaving covered employment with less than 5 years of service (7 years for members joining after October 31, 2017) for a reason other than the member's death. Optionally, members eligible for other benefits may withdraw their contributions in lieu of the regular benefits due.

b. Benefit: The member who withdraws receives a lump-sum payment of his/her employee contributions, plus a portion of the interest credited by the System on these contributions. Interest is credited at an annual rate of 8%. The portion of the interest paid on termination depends on the member's years of service as follows:

Years of Service	Percent of Interest Refunded
0-15	50%
16-21	60%
22-25	75%
26 or more	90%

16. Death in Service

a. Eligibility: Death must have occurred while an active member.

b. Benefit: Upon the death of an active member, a refund of the member's contributions and 100% of the interest credited is paid. In addition, a lump sum of $18,000 will be paid. If the member is eligible for retirement (early or normal) at the time of death, and the member is married, the spouse may elect to receive a monthly life annuity equal to the retirement benefit for which the member was eligible, reduced as though the member had elected to receive benefits under Option 2 (see below). This annuity is paid in lieu of both (i) the $18,000 lump-sum death benefit and (ii) the refund of contributions.

The spouse of an EESIP eligible member can elect to receive the enhanced benefit described under Item 22 below.

APPENDIX I (Continued)

17. Optional Forms of Payment: In addition to the "Maximum Option" described under Normal Retirement, above, there are optional forms of payment available on an actuarially equivalent basis, as follows:

    a. Option 1 - A modified cash refund annuity payable for life with a guaranteed refund of the member's contributions and interest, less the total of the "annuity" payments paid. (The "annuity" payment is the portion of the monthly benefit provided by the member's own account balance.)

    b. Option 2 - A joint life annuity payable while both the member and the joint annuitant are alive; and if the member dies before the joint annuitant, continuing without change to the joint annuitant; or if the joint annuitant dies before the member, "popping-up" to the original life annuity amount and continuing for the life of the member.

    c. Option 3 - A joint life annuity payable while both the member and the joint annuitant are alive; and if the member dies before the joint annuitant, continuing at 50% of this amount for the joint annuitant's lifetime; or if the joint annuitant dies before the member, "popping-up" to the original life annuity amount and continuing for the life of the member.

    d. Option 4 - A life annuity with a guarantee that if the member dies before 120 payments (10 years) have been made; the payments will be continued to the member's beneficiary for the balance of the ten-year period.

    e. PLSO Option - A partial lump-sum option (PLSO) is allowed for those members with at least 30 years of service upon retirement. The amount of the PLSO is equal to 12, 24, or 36 times the member's monthly retirement benefit, determined before applying any reduction for the PLSO or any other optional form of payment. A member who elects to receive a PLSO will have his/her monthly retirement benefit reduced on an actuarial basis to compensate for the fact that a PLSO is provided. A member who elects a PLSO may elect any of the other optional forms of payment as well, taking a further reduction in the annuity amount.

    Actuarial equivalence is based on tables adopted by the Board of Trustees.

18. Special Retirees: This is a group of retirees who have been granted a special $150 per month benefit although they did not fulfill the requirements for service retirement. With cost of living increases, the special retirees now average $195 per month.

19. Supplemental Medical Insurance

    a. Eligibility: All retired members (including service retirees and disabled retirees but excluding the special retirees and spouses or beneficiaries) who have at least 10 years of service credit are eligible for a supplemental medical insurance payment.

    b. Monthly Benefit: Eligible members receive the smaller of (i) a Medicare supplement benefit, if eligible, or (ii) an amount between $100 and $105 per month, depending on service and Final Average Compensation.

    c. Payment Form: Benefits are payable as a life annuity on behalf of the retired member to (i) the Oklahoma Employees' Group Insurance Plan, if the member has health coverage under this Plan, or (ii) to the member's former employer, if the member retains health coverage under a plan maintained by the former employer.

20. Post-retirement Death Benefit

    a. Eligibility: All retired members (including service retirees and disabled retirees but excluding the special retirees and spouses or beneficiaries) are eligible for a post-retirement death benefit.

    b. Benefit: A lump-sum payment of $5,000.

21. Cost-of-living Increase: From time to time, the System has been amended to grant certain post-retirement benefit increases. However, the System has no automatic cost-of-living increase features.

22. EESIP: The Education Employees Service Incentive Plan (EESIP) was created in 2006. Active members are eligible for the EESIP if they have service prior to July 1, 1995, are active on or after July 1, 2006, and are not employed by one of the comprehensive or regional four-year universities.

    The EESIP allows for two years of service prior to July 1, 1995 to be computed at an enhanced or eliminated cap for each year that the employee has worked beyond Normal Retirement Age at the time of retirement.

    For each "uncapped" year, the $40,000 cap applicable to service before July 1, 1995 is increased to $60,000 for retirements in FY 2007, to $80,000 for retirements in FY 2008, and the cap is removed beginning July 1, 2008. The employee that elects the enhanced benefit must pay the accumulations, at 10% interest, of contributions that would have been required but for the cap then in place. Payment is required only for years FY 1988 through FY 1995 even if more than 8 years of service prior to July 1, 1995 are being "uncapped." Payment is required only for those years of service that are computed at an elevated or eliminated cap.

APPENDIX I (Continued)

Contributions are required at the following rates for salary in excess of the $25,000 or $40,000 cap earned in years FY 1998 through FY 1995:

Fiscal Year	Contribution Percentage
FY 1995	8.00%
FY 1994	9.00%
FY 1993	11.00%
FY 1992	11.00%
FY 1991	11.00%
FY 1990	10.50%
FY 1989	10.00%
FY 1988	10.00%

For those members electing the enhanced benefit, the payment required is 50% of the accumulated balance in FY 2007, 75% of the accumulated balance in FY 2008 and 100% of the accumulated balance on or after FY 2009.

APPENDIX II

HISTORY OF MAJOR LEGISLATIVE CHANGES

APPENDIX II

History of Major Legislative Changes

1990 Legislative Session

1. An ad hoc benefit increase was granted to retirees and beneficiaries who had been receiving benefits for at least one year. Special retirees were not granted this increase. The increase was determined by adding an amount to the Final Average Compensation for the member, and then re-determining the benefit due. For classified members, the amount added was \$950, while for non-classified members, the amount added was \$475. In all cases, Final Average Compensation was capped at \$40,000.

2. The local employer contribution rate was increased from 1.0% of covered compensation in accordance with the following schedule:

Year Beginning July 1	Local Employer Contribution Rate
(1)	(2)
1990	1.0%
1991	1.5%
1992	2.0%
1993	2.5%

1991 Legislative Session

No legislation enacted with an actuarial impact to the System.

1992 Legislative Session

SB 568 made the following changes:

1. Increased employer rates (grading from 7% for 1992/1993 to 18% for 2004/2005) and changed State contributions to offset for employer contributions.
2. Eliminated the salary cap effective July 1, 1995.
3. Changed the member contribution rate to 7% (after July 1, 1997, phased in prior to that date).
4. Changed the FAC averaging period to five years for new members.
5. Eliminated the \$18,000 death benefit (and the optional survivor annuity) for new members.
6. Changed the formula to cap FAC with the member's pay cap for service prior to July 1, 1995.
7. Changed the Rule of 80 to the Rule of 90 for new members.

APPENDIX II (Continued)

1993 Legislative Session

SB 535 set forth a schedule which reduces the maximum payment for supplemental medical insurance from $75/month to an amount between $70 and $75 per month, depending on service and Final Average Compensation.

1994 Legislative Session

1. HB 2228 provided for an ad hoc COLA payable to members receiving benefits. The average increase is about 2.5%.

2. SB 768 changed the System's joint options to "pop-up" options. Under a pop-up option, if the joint annuitant predeceases the member, the member's benefit is increased to the amount it would have been if the member had elected a life only annuity.

3. SB 767 provided for the transfers of service credit between this System and the Oklahoma Public Employees Retirement System.

4. SB 615 provides that the local employer's contribution rate shall not be less than the local employer's contribution rate for the prior year.

1995 Legislative Session

SB 527 modified the provisions affecting members employed in higher education who became members prior to July 1, 1995. For these members, the $40,000 and $25,000 pay caps were left in place for two additional years, but were indexed to $44,000 and $27,500 for 1995-96 members was set to 6.0% for 1995-96 and 6.5% for 1996-97. The benefit provisions were also modified so that only pay up to the maximum would be recognized for these years. After June 30, 1997, these members will contribute 7% of total pay like all other members. In addition, SB 527 modified the SB 568 employer contribution rate schedule. The new employer rates are 50 basis points lower in each year until the rate reaches 18.00%.

1996 Legislative Session

SB 832 modified the provisions relating to (i) member contributions, (ii) maximum compensation, and (iii) the benefit formula, for members employed in higher education. Beginning July 1, 1995, all members will contribute on all pay, except for members employed by a comprehensive university who became a member before July 1, 1995, whose recognized compensation is limited to:

APPENDIX II (Continued)

	For members who elected the $25,000 limit prior to June 30, 1995	For all other members
1996-97	$32,500	$49,000
1997-98	37,500	54,000
1998-99	42,500	59,000
1999-00	47,500	64,000
2000-01	52,500	69,000
Thereafter	No limit	No limit

Employer contributions will be based on the same compensation as member contributions. In 1996-98, member contributions will be 6.5% of pay up to $25,000 plus 7% of pay in excess of $25,000, up to the maximum recognized compensation. The benefit formula was also adjusted so that for service earned between July 1, 1995 and June 30, 2001, members in higher education have their benefits adjusted for the compensation limits.

1997 Legislative Session

The post-retirement death benefit was increased from $4,000 to $5,000.

1998 Legislative Session

1. An ad hoc benefit increase was granted to retirees and beneficiaries who had been receiving benefits for at least one year. The increase was determined by adding an amount to the Final Average Compensation for the member, and then redetermining the benefit due. For classified members, the amount added was $1,400, while for non-classified members, the amount added was $700. Special retirees received a 5.4% increase.

2. The funding mechanism was changed, eliminating the State's contribution of 78% of its Gross Production Tax receipts after the 1999 fiscal year and substituting a contribution based on a percentage of general revenue available for appropriation (95% of general revenue). The percentage is 3.25% for the fiscal year ending June 30, 2000, and 3.50% thereafter. The local employer's contribution rates were revised for years after the 1999 fiscal year as follows:

Year	Employer Rate
1999/2000	4.80%
2000/2001	5.80%
2001/2002	6.80%
Thereafter	7.05%

APPENDIX II (Continued)

1999 Legislative Session

1. The pay caps applicable to certain members employed by one of the comprehensive universities were extended to FY 2007. The cap in effect for FY 1999 was left unchanged for FY 2000, and then will be increased $5,000 each year thereafter. This change affects both contributions and benefit calculations for these members.

2. The State's funding mechanism was changed again. Now the dedicated State revenue will be 3.54% of certain specified sales and income tax revenues. This amount is subject to a $136.0 million maximum contribution for FY 2000 only.

2000 Legislative Session

1. An ad hoc benefit increase was granted to retirees and beneficiaries who had been receiving benefits for at least one year. The increase was determined by adding an amount to the Final Average Compensation for the member, and then redetermining the benefit due. For classified members, the amount added was $500, while for non-classified members, the amount added was $250. Special retirees received a 1.8% increase.

2. SB 994 set forth a schedule which increases the maximum payment for supplemental medical insurance by $30/month from an amount between $70 and $75 per month to an amount between $100 and $105 per month, depending on service and Final Average Compensation.

2001 Legislative Session

No legislation enacted with an actuarial impact to the System.

2002 Legislative Session

1. An ad hoc benefit increase was granted to retirees and beneficiaries, beginning July 1, 2002, if they had been receiving benefits for at least one year. Retirees were given a 3% increase if they had less than 30 years of credited service and a 4% increase if they had 30 or more years of credited service. Special retirees received a 3% increase.

2. The dedicated State revenue is equal to a percentage of the State's revenue from certain sales and income taxes. The percentage is currently 3.54%, but a bill was passed to increase the percentage over the next five years to 5.00%, according to this schedule.

FY 2003	3.54%
FY 2004	3.54%
FY 2005	3.75%
FY 2006	4.00%
FY 2007	4.50%
FY 2008	5.00%

APPENDIX II (Continued)

2003 Legislative Session

1. The service requirement for vesting was changed from ten years to five years. Under this provision, a member is now able to retire with an unreduced retirement benefit after reaching age 62 with credit for 5 or more years of service. A member who has reached age 55, but not age 62, with at least 5 years of service, is able to retire and receive a reduced retirement benefit. A member who has terminated before being eligible to retire, but who has at least 5 years of service, may elect a deferred retirement benefit in lieu of a refund. However, members must still have credit for at least 10 years of service in order to be eligible for a disability benefit or the medical insurance premium supplement.

2. Refunds for members who have less than seven years of service will receive their contributions plus 50% of the interest on their account. Previously members with less than seven years of service received no interest. Interest is computed at 8.00%

3. A partial lump-sum option (PLSO) was added. Members who retire with at least 30 years of service may elect a PLSO equal to 12, 24, or 36 times the member's monthly retirement benefit, determined before applying any reduction for the PLSO or any other optional form of payment. A member who elects to receive a PLSO will have his/her monthly retirement benefit reduced on an actuarial basis to compensate for the fact that a PLSO is provided.

4. Disabled members may now elect Option 2—the Joint & 100% Survivor option (with pop up).

2004 Legislative Session

1. An ad hoc benefit increase was granted to retirees and beneficiaries, beginning August 1, 2004, if they had retired on or before June 30, 2003. Special retirees received a 4.0% increase, and increases for other eligible retirees are as follows:

Years of Service	Monthly Benefit at 6/30/04	Benefit Increase
20 Years or more	Less than $1,500.00	4.5%
	$1,500.00 to $2,500.00	4.0%
	Over $2,500.00	3.5%
15 to 19 Years	Less than $1,000.00	4.0%
	$1,000.00 to $2,000.00	3.5%
	Greater than $2,000.00	3.0%
Fewer than 15 years	Less than $801.00	3.5%
	$801.00 to $1,499.99	3.0%
	$1,500.00 or greater	2.5%

APPENDIX II (Continued)

2. Members who joined the System on or after July 1, 1992 receive a year of service credit if they have accumulated 120 days of unused sick leave. Previously, this additional service was only available to members hired prior to July 1, 1992.

3. Beneficiaries of members hired on or after July 1, 1992 are eligible to receive an $18,000 lump sum death benefit in addition the member's contribution balance with 100% of credited interest. If the member was eligible for early or normal retirement, the beneficiary may choose the retirement benefit for which the member was eligible in lieu of the contribution balance and $18,000 lump sum. Previously, the annuity option and $18,000 lump sum had only been available to members hired before July 1, 1992.

4. The benefit formula for members hired in FY 1996 at any of the colleges or universities in the Oklahoma State System of Higher Education is 2.0% of final average salary, computed at retirement, for each year of service. Previously, the formula was 2.0% of salary for service in FY 1996 plus 2.0% of final average salary, computed at retirement, for each year of service earned after June 30, 1996.

5. Employees hired by one of the comprehensive universities – Oklahoma University, the Health Sciences Center, and Oklahoma State University – after June 30, 2004 may make an irrevocable election to join an alternate plan established by the universities in lieu of becoming a member of OTRS.

6. The Board of Trustees is required to adopt an assumption as to the level of probable future ad hoc cost-of-living adjustments that will be granted by the legislature in the future.

7. The supplemental medical insurance credit is restricted to members who retire with at least 10 years of service credit.

8. The formula used to determine benefits accrued for service earned between July 1, 1995 and June 30, 2007, for members employed by a comprehensive university, is modified. Retirees who had service at a comprehensive university after June 30, 1995 will receive a benefit increase because of this formula change, effective as of January 1, 2005. No retroactive increase will be paid to such retirees.

9. Members who are employed by a comprehensive university before July 1, 2004 will be given a future opportunity to make a one-time irrevocable election to leave OTRS and join an alternative plan established by the universities. The timing of the election depends on if and when IRS approval is received.

10. The comprehensive universities will make additional contributions to OTRS on behalf of members in their alternative plan.

2005 Legislative Session

No legislation enacted with an actuarial impact to the System.

APPENDIX II (Continued)

2006 Legislative Session

1. The Education Employees Service Incentive Plan (EESIP) was created:

   Active members are eligible for the EESIP if they have service prior to July 1, 1995, are active on or after July 1, 2006, and are not employed by one of the comprehensive or regional four-year universities.

   The EESIP allows for two years of service prior to July 1, 1995 to be computed at an enhanced or eliminated cap for each year that the employee has worked beyond Normal Retirement Age at the time of retirement.

   For each "uncapped" year, the $40,000 cap applicable to service before July 1, 1995 is increased to $60,000 for retirements in FY 2007, to $80,000 for retirements in FY 2008, and the cap is removed beginning July 1, 2008. The employee that elects the enhanced benefit must pay the accumulations, at 10% interest, of contributions that would have been required but for the cap then in place. Payment is required only for years FY 1988 through FY 1995 even if more than 8 years of service prior to July 1, 1995 are being "uncapped." Payment is required only for those years of service that are computed at an elevated or eliminated cap.

   For those members electing the enhanced benefit, the payment required is 50% of the accumulated balance in FY 2007, 75% of the accumulated balance in FY 2008 and 100% of the accumulated balance on or after FY 2009.

2. The employer contribution rate was increased for employers covered by the EESIP. The rate increased from 7.05% to 7.60% effective Jan. 1, 2007, and then to 7.85% for FY 2008 and to 8.00% for FY 2009. The employer contribution rate for the employers not covered by the EESIP—the comprehensive and regional four-year universities—remained at 7.05%.

3. A 2.00% ad hoc cost-of-living adjustment (COLA) was provided, effective July 1, 2006. All retirees who retired before July 1, 2005 were eligible, including disabled retirees, special retirees and beneficiaries receiving payments.

2007 Legislative Session

The employer contribution rates, beginning July 1, 2007, were increased as shown in the following schedule. Different rates are paid by employers in the Education Employees Service Incentive Plan (EESIP) and those not in EESIP (the comprehensive and regional four-year universities):

	Employer Contribution Rates	
Period	EESIP Employers	Non-EESIP Employers
7/1/2006 – 12/31/2006	7.05%	7.05%
1/1/2007 – 6/30/2007	7.60%	7.05%
7/1/2007 – 12/31/2007	7.85%	7.05%
1/1/2008 – 6/30/2008	8.35%	7.55%
7/1/2008 – 12/31/2008	8.50%	7.55%
1/1/2009 – 6/30/2009	9.00%	8.05%
7/1/2009 – 12/31/2009	9.00%	8.05%
1/1/2010 – 6/30/2010	9.50%	8.55%
FY 2011 and later	9.50%	8.55%

2008 Legislative Session

A 2.00% ad hoc cost-of-living adjustment (COLA) was provided, effective July 1, 2008. All retirees who retired before July 1, 2007 were eligible, including disabled retirees, special retirees and beneficiaries receiving payments.

2009 Legislative Session

No legislation enacted with an actuarial impact to the System.

2010 Legislative Session

1. HB 1935 allows a retiree electing one of the optional benefit forms (i.e. not life only) to make a one-time irrevocable change in the benefit option within 60 days of retirement. The beneficiary may not be changed.

2. SB 859 allows a retiree who chose a life annuity at retirement to change to Retirement Option 2 or 3 (100% joint survivor annuity and 50% joint survivor annuity respectively) within a year of marriage.

APPENDIX II (Continued)

2011 Legislative Session

1. SB 377 changes the eligibility conditions for both normal and early retirement for members hired on or after November 1, 2011. Members will be eligible for normal retirement at the earlier of age 65 with 5 years of service or when their age plus service equals 90 (Rule of 90) with a minimum age of 60. Members will be eligible for early (reduced) retirement at age 60 with 5 years of service.

2. HB 2132 changes the definition of a nonfiscal retirement bill to exclude cost of living adjustments (COLA) even if such COLAs are assumed in the annual actuarial valuation.

3. SB 782 eliminates the requirement that statewide retirement systems report a second set of actuarial valuation results to the Oklahoma State Pension Commission using specified actuarial assumptions.

2012 Legislative Session

No legislation enacted with an actuarial impact to the System.

2013 Legislative Session

No legislation enacted with an actuarial impact to the System.

2014 Legislative Session

No legislation enacted with an actuarial impact to the System.

2015 Legislative Session

No legislation enacted with an actuarial impact to the System.

2016 Legislative Session

No legislation enacted with an actuarial impact to the System.

2017 Legislative Session

1. HB 1162 changes the "vesting" period to be eligible for benefits from five to seven years for members who join TRS after October 31, 2017.

2. SB 428 relaxes income restrictions for certain retirees who come back to work as teachers. The exception to the general limitations on post-retirement employment and income will last three (3) years from July 1, 2017 through June 30, 2020.

APPENDIX II (Continued)

2018 Legislative Session

HB 1340 changed the definition on a "nonfiscal retirement bill" for the Oklahoma public retirement systems to include one-time payments that do not permanently increase retirement benefits payable where the maximum amount of such payments is dependent on the System's funded ratio after the payment. The bill also authorized a payment effective October 1, 2018 for members who have been retired at least five years in an amount equal to the lesser of 2% of the gross annual benefit or $1,000 subject to a $350 minimum for members who had at least 20 years of service.

HB 1023 adjusted the minimum teacher salary schedule to provide increases of 15.8 percent to 18.25 percent for certified education personnel (except superintendents), depending on their years of experience and degree level. In dollar terms, the raises ranged from $5,000 for a first-year teacher with a bachelor's degree to $8,395 for a 25-year teacher with a doctorate. The bill required districts to provide the full pay raise to all teachers, including those who were already paid above the minimum salary schedule. This bill did not change the benefits provided by the System but it did have a sizable impact on the actuarial valuation of the System.

2019 Legislative Session

No legislation enacted with an actuarial impact to the System.

APPENDIX III

SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS

Appendix III
Summary of Actuarial Assumptions and Methods

I. *<u>Valuation Date</u>*

The valuation date is June 30th of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

II. *<u>Actuarial Cost Method</u>*

Because the employer contribution rate is set by statute, the actuarial valuation is used to determine the number of years required to amortize the Unfunded Actuarial Accrued Liability (UAAL), or the funding period.

The Individual Entry Age Normal actuarial cost method assigns the plan's total unfunded liabilities (the actuarial present value of future benefits less the actuarial value of assets) to various periods. The unfunded actuarial accrued liability is assigned to years prior to the valuation, and the normal cost is assigned to the year following the valuation. The remaining costs are the normal costs that will be recognized in future years. The resulting actuarially determined contribution requirement is composed of (i) the applicable year's normal cost, plus (ii) a payment intended to reduce the unfunded actuarial accrued liability.

The normal contribution is determined using the Individual Entry Age Normal method. Under this method, a calculation is made to determine the rate of contribution which, if applied to the compensation of each individual member during the entire period of anticipated covered service, would be required to meet the cost of all benefits payable on his behalf. The salary-weighted average of these rates is the normal cost rate. This calculation reflects the plan provisions that apply to each individual member. The employer normal cost rate is equal to (i) the normal cost rate, plus (ii) the expected administrative expenses, minus (iii) the member contribution rate.

The actuarial accrued liability is the difference between the total present value of future benefits and the actuarial present value of future normal costs. The unfunded actuarial accrued liability is the excess of the actuarial accrued liability over the actuarial value of assets.

The funding period is calculated as the number of years required to fully amortize the UAAL, assuming that: (a) future market earnings, net of investment-related expenses, will equal 7.50% per year, (b) there will be no liability gains/losses or changes in assumptions, (c) the number of active members will remain unchanged, (d) active members who leave employment will be replaced by new entrants each year, and (e) employer contributions and dedicated State revenue will remain the same percentage of payroll as projected for the current fiscal year.

The Entry Age actuarial cost method is an “immediate gain” method (i.e., experience gains and losses are separately identified as part of the UAAL). However, they are amortized over the same period applied to all other components of the UAAL.

Appendix III (Continued)

III. *Actuarial Value of Assets*

The actuarial value of assets is equal to the market value, adjusted for a five-year phase in of actual investment return in excess of expected investment return. The actual return is calculated net of investment-related expenses, and the expected investment return is equal to the assumed investment return rate multiplied by the prior year's market value of assets, adjusted for contributions, administrative expenses, benefits paid, and refunds.

Prior to the June 30, 2015, the actual and expected returns on plan assets were also determined net of administrative expenses.

IV. *Actuarial Assumptions*

A. Economic Assumptions

1. Investment return: 7.50% per year, net of investment-related expenses and compounded annually, composed of an assumed 2.50% inflation rate and a 5.00% real rate of return.

2. Administrative expenses: 0.10% of valuation payroll per year

3. Salary increase rate: A 3.25% wage inflation component, including 2.50% price inflation, plus a service-related component as shown below:

Years of Service	Service-Related Component	Total Salary Increase Rate
(1)	(2)	(3)
0	8.00%	11.25%
1-2	1.50%	4.75%
3-4	1.25%	4.50%
5-11	1.00%	4.25%
12-17	0.75%	4.00%
18-21	0.50%	3.75%
22-24	0.25%	3.50%
25 or more	0.00%	3.25%

4. Payroll growth rate: In the amortization of the unfunded actuarial accrued liability, payroll is assumed to increase 2.75% per year. This increase rate has no allowance for future membership growth.

5. Future ad hoc cost-of-living increases: None.

B. <u>Demographic Assumptions</u>

1. Mortality rates - after retirement or termination.

   a. Healthy males – RP-2000 Combined Healthy mortality table for males with White Collar Adjustments. Generational mortality improvements in accordance with Scale BB from the table's base year of 2000.

   b. Healthy females – GRS Southwest Region Teacher Mortality Table, scaled at 105%. Generational mortality improvements in accordance with Scale BB from the table's base year of 2012.

   c. Disabled males – RP-2000 Mortality Table for disabled males, multiplied by 75%, no set back.

   d. Disabled females – RP-2000 Mortality Table for disabled females, multiplied by 100%, no set back.

2. Mortality rates for active members – RP-2000 Employee Mortality tables, with male rates multiplied by 60% and female rates multiplied by 50%.

   <u>Mortality Improvement</u>: The nondisabled annuity mortality assumption includes an explicit generational mortality improvement assumption. To account for future mortality improvement for disabled annuitants and active members, the tables and table multipliers selected above were chosen so that the assumed mortality rates are smaller than the rates observed in the last experience study, covering experience for FY 2010 – FY 2014. The ratio of the actual number of deaths occurring during this period to the expected number based on the selected assumptions was:

   - 116% for disabled male annuitants
   - 120% for disabled female annuitants
   - 127% for active male members
   - 116% for active female members

Appendix III (Continued)

3. Disability rates - Based on 2014 Experience Study, males and females separate. Sample rates are shown below:

	Expected Disabilities Occurring per 100 Lives	
Age	Male Members	Female Members
(1)	(2)	(3)
25	0.023	0.020
30	0.023	0.020
35	0.032	0.040
40	0.059	0.100
45	0.090	0.160
50	0.270	0.240
55	0.405	0.370
60	0.158	0.260
65	0.000	0.000

Disability rates are applied only for members with 10 or more years of service, since rates were developed based on exposure for this group.

Appendix III (Continued)

4. Termination Rates – Rates based on the member's service, developed from the 2014 Experience Study. Rates reflect terminations for causes other than death, disability or retirement. Sample rates are shown below:

Expected Terminations per 100 Lives

Credited Service (Years)	Males and Females
(1)	(2)
0	23.00
1	18.00
2	13.00
3	11.00
4	9.00
5	8.25
6	7.50
7	6.75
8	6.00
9	5.25
10	4.50
11	4.25
12	4.00
13	3.75
14	3.50
15	3.25
16	3.00
17	2.75
18	2.50
19	2.25
20	2.00
21	1.75
22	1.75
23	1.50
24	1.50
25 or more	0.00

Termination rates are not applied to a member who is eligible for a retirement benefit (reduced or unreduced).

Appendix III (Continued)

5. Retirement rates - Separate male and female rates, based on age, developed from the 2014 Experience Study. Sample rates are shown below:

	Expected Retirements per 100 Lives			
	Unreduced Retirement		Reduced Retirement	
Age	Males	Females	Males	Females
Under 50	0.0	0.0	0.0	0.0
50	12.0	12.5	0.0	0.0
51	12.0	12.5	0.0	0.0
52	12.0	12.5	0.0	0.0
53	12.0	12.5	0.0	0.0
54	12.0	12.5	0.0	0.0
55	12.0	12.5	1.0	1.5
56	12.0	14.0	1.8	2.0
57	12.0	14.0	2.0	2.3
58	12.0	14.0	2.3	2.5
59	12.0	16.0	2.5	2.8
60	12.0	16.0	2.8	3.0
61	15.0	20.0	3.0	3.5
62	21.0	25.0	10.0	10.0
63	19.0	20.0	7.5	7.5
64	15.0	20.0	7.5	7.5
65	25.0	25.0		
66	22.5	25.0		
67	22.5	25.0		
68	20.0	22.5		
69	20.0	22.5		
70	20.0	22.5		
71	20.0	22.5		
72	20.0	22.5		
73	20.0	22.5		
74	20.0	22.5		
75 and over	100.0	100.0		

The retirement assumption was further modified for members hired after June 30, 1992. The probability of retirement upon first eligibility for Rule of 90 reflects the accumulated probably of retirement between Rule of 80 and Rule of 90, as applicable.

Appendix III (Continued)

C. Other Assumptions

1. Percent married: 80% of employees are assumed to be married.

2. Age difference: Males are assumed to be three years older than females.

3. Percent electing annuity on death (when eligible): All of the spouses of married participants who die after becoming eligible for a retirement benefit are assumed to elect an annuity, in lieu of the $18,000 lump sum and refund.

4. Percent electing deferred termination benefit: vested terminating members are assumed to elect a refund or a deferred benefit, whichever is more valuable at the time of termination.

5. Assumed age for commencement of deferred benefits: Members electing to receive a deferred benefit are assumed to commence receipt at age 62 (age 65 if hired on or after November 1, 2011).

6. Supplemental medical insurance: 50% of eligible members who are active or due a deferred vested benefit are assumed to elect the insurance benefit. For annuitants who began receiving a benefit in the year preceding the valuation date, 50% of those not already receiving the benefit are assumed to elect it. The liability for all other annuitants is based on the actual benefit being paid as shown in the data.

7. Members who retire with at least 24 years of credited service are assumed to have 120 days of unused sick leave for which they will receive one year of service credit. This assumption only applies to reduced and unreduced retirement.

8. No assumption was made that current active members employed by the comprehensive universities will elect to transfer out of OTRS.

9. Reemployment, purchase of service, transfers: No recognition is made of (i) future member reimbursements upon reemployment, (ii) future purchase of additional service, or (iii) special transfer provisions.

10. For EESIP eligible employees, if the refund amount to be paid exceeds the actuarial present value of the additional benefit, then we assume the member does not elect the enhanced benefit.

11. Decrement timing: Decrements of all types are assumed to occur mid-year.

Appendix III (Continued)

V. *Participant Data*

Participant data was supplied on an electronic file for (i) active members, (ii) inactive vested members who are entitled to a future deferred benefit, (iii) inactive nonvested members who are entitled to a refund of their employee contributions, and in some cases a portion of the accumulated interest, and (iv) members and beneficiaries receiving benefits.

The data for active and inactive, non-retired members included date of birth, date of hire, gender, years of service, salary, employee contributions and accumulated interest on employee contributions. The data also included a code to indicate whether the employee had elected to make contributions on salary above $25,000, and a code indicating the type of employer (comprehensive university, other college or university, or other employer). For retired members and beneficiaries, the data included date of birth, gender, spouse's date of birth (where applicable), amount of monthly benefit, date of retirement, and a form of payment code.

Individual member contributions for the 12 months prior to the valuation date were used to determine the actual salary for plan members in the prior plan year. The valuation assumptions for salary increases were used to determine the projected salary for the current plan year. Additionally, contributing members were assumed to accrue one additional year of service between the end of the prior employment year and the valuation date.

Additional assumptions were made to correct for missing or inconsistent data. These had no material impact on the results presented.

Some inactive, nonvested employees who are entitled to a refund are not included in the data, but a liability for their refund is included instead in the Suspense Fund, which is included in the liability.

APPENDIX IV

GLOSSARY

APPENDIX IV
Glossary

Actuarial Accrued Liability (AAL): That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of Future Plan Benefits which is not provided for by future Normal Costs. It is equal to the Actuarial Present Value of Future Plan Benefits minus the actuarial present value of future Normal Costs.

Actuarial Assumptions: Assumptions as to future experience under the System. These include assumptions about the occurrence of future events affecting costs or liabilities, such as:

- mortality, withdrawal, disablement, and retirement;
- future increases in salary;
- future rates of investment earnings and future investment and administrative expenses;
- characteristics of members not specified in the data, such as marital status;
- characteristics of future members;
- future elections made by members; and
- other relevant items.

Actuarial Cost Method or ***Funding Method:*** A procedure for allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability. These items are used to determine the ADEC.

Actuarial Gain or ***Actuarial 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. Through the actuarial assumptions, rates of decrements, rates of salary increases, and rates of fund earnings have been forecasted. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge which may be the same as forecasted, or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., the System's assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, actuarial losses are the result of unfavorable experience, i.e., actual results that produce actuarial liabilities which are larger than projected. Actuarial gains will shorten the time required for funding of the actuarial balance sheet deficiency while actuarial losses will lengthen the funding period.

Actuarial Present Value (APV): The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions. For purposes of this standard, each such amount or series of amounts is:

a. adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.),
b. multiplied by the probability of the occurrence of an event (such as survival, death, disability, termination of employment, etc.) on which the payment is conditioned, and
c. discounted according to an assumed rate (or rates) of return to reflect the time value of money.

Appendix IV (Continued)

Actuarial Present Value of Future Plan Benefits: The Actuarial Present Value of those benefit amounts which are expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future compensation and service credits. The Actuarial Present Value of Future Plan Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive, nonretired members either entitled to a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would be provide sufficient assets to pay all projected benefits and expenses when due.

Actuarial Valuation: The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan. An Actuarial Valuation for a governmental retirement system typically also includes calculations of items needed for compliance with GASB, such as the funded ratio and the ADEC.

Actuarial Valuation Date or ***Valuation Date:*** The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Plan Benefits is determined. The expected benefits to be paid in the future are discounted to this date.

Actuarial Value of Assets or ***Valuation Assets:*** The value of the System's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly actuaries use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the ADEC.

Actuarially Determined: Values which have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the law.

Actuarially Determined Employer Contribution (ADEC): The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation, determined in accordance with a specified funding policy. The ADEC consists of the Employer Normal Cost and the Amortization Payment.

Actuarially Equivalent: Of equal actuarial present value, determined as of a given date and based on a given set of Actuarial Assumptions.

Amortization Method: A method for determining the Amortization Payment. The most common methods used are level dollar and level percentage of payroll. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the stream of payments increases at the assumed rate at which total covered payroll of all active members will increase.

Amortization Payment: That portion of the pension plan contribution, or ADEC, which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

Appendix IV (Continued)

Closed Amortization Period: A specific number of years that is counted down by one each year and therefore declines to zero with the passage of time. For example if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc. See Funding Period and Open Amortization Period.

Decrements: Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or termination.

Defined Benefit Plan: An employer-sponsored retirement benefit that provides workers, upon attainment of designated age and service thresholds, with a monthly benefit based on the employee's salary and length of service. The value of a benefit from a defined benefit plan is generally not affected by the return on the assets that are invested to fund the benefit.

Defined Contribution Plan: A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, and the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.

Employer Normal Cost: The portion of the Normal Cost to be paid by the employers. This is equal to the Normal Cost less expected member contributions.

Experience Study: A periodic review and analysis of the actual experience of the System which may lead to a revision of one or more actuarial assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified as deemed appropriate by the Actuary.

Funded Ratio: The ratio of the actuarial value of assets (AVA) to the actuarial accrued liability (AAL). Plans sometimes calculate a market funded ratio, using the market value of assets (MVA), rather than the AVA.

Funding Period or ***Amortization Period:*** The term "Funding Period" is used it two ways. In the first sense, it is the period used in calculating the Amortization Payment as a component of the ADEC. This funding period is chosen by the Board of Trustees. In the second sense, it is a calculated item: the number of years in the future that will theoretically be required to amortize (i.e., pay off or eliminate) the Unfunded Actuarial Accrued Liability, based on the statutory employer contribution rate, and assuming no future actuarial gains or losses.

GASB: Governmental Accounting Standards Board. The organization that establishes the accounting rules for public retirement systems and the employers that sponsor or contribute to them.

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. Any payment in respect of an Unfunded Actuarial Accrued Liability is not part of Normal Cost (see Amortization Payment). For pension plan benefits which are provided in part by employee contributions, Normal Cost refers to the total of employee contributions and employer Normal Cost unless otherwise specifically stated. Under the entry age normal cost method, the Normal Cost is intended to be the level cost (when expressed as a percentage of pay) needed to fund the benefits of a member from hire until ultimate termination, death, disability or retirement.

Open Amortization Period: An open amortization period is one which is used to determine the Amortization Payment but which does not change over time. In other words, if the initial period is set as 30 years, the same 30-year period is used in determining the Amortization Period each year. In theory, if an Open Amortization Period is used to amortize the Unfunded Actuarial Accrued Liability, the UAAL will never completely disappear, but will become smaller each year, either as a dollar amount or in relation to covered payroll.

Unfunded Actuarial Accrued Liability: The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus.