Teachers' Retirement System of Oklahoma

Actuarial Valuation Report
As of June 30, 2017

GRS Retirement Consulting
P: 469.524.0000 | F: 469.524.0003 | www.grsconsulting.com

October 18, 2017

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, 2017

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, 2017. 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 2017.

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 2017 was 7.70% and will increase to 7.80% for FY 2018.

For the fiscal year ending June 30, 2017, the dedicated State revenue plus the matching contribution was equivalent to a contribution rate of approximately 7.5% 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 7.7%. 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 17.0% of covered payroll (7.7% + 9.3% = 17.0%) 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 14.7% for the fiscal year ending June 30, 2017. The actuarial value of assets had a smaller return of 9.0% due to the continued recognition of asset losses over the past few years but still exceeded the assumed rate of 7.50%. The excess return on an actuarial of assets basis resulted in an asset gain of almost $218 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 $15.516 billion is $53 million higher than the market value of $15.463 billion, and the actuarial value of assets is approximately 100.3% of the market value.

PROGRESS TOWARD REALIZATION OF FINANCING

The unfunded actuarial accrued liability (UAAL) as of June 30, 2016 was $7.615 billion based on the actuarial value of assets, and it decreased to $6.538 billion this year. As a result, the System's funded ratio—actuarial value of assets divided by the actuarial accrued liability—increased from 65.7% to 70.4% as of June 30, 2017. If measured on the market value of assets, the funded ratio would decrease slightly to 70.1%. The increase from last year was due to several factors including the impact of an assumption change effective with this valuation, liability gains resulting largely from salaries increasing more slowly than assumed and more terminations than expected, as well as the asset gain mentioned earlier.

BENEFIT PROVISIONS

Our actuarial valuation as of June 30, 2017 reflects the benefit and contribution provisions set forth in current statutes. There were no bills enacted during the 2017 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.

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, 2017 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, 2017 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.

In addition to the information presented in this report, GRS prepared the Schedule of Increases and Decreases of Benefit Recipients presented in the Actuarial Section of the System's CAFR. Additionally, GRS prepared the Sensitivity of the Net Pension Liability, the Schedule of Changes in the Employers' Net Pension Liability and Related Ratios, and the Schedule of Employer Contributions presented in the Financial Section of the System's CAFR.

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,

Mark R. Randall

Mark R. Randall, FCA, MAAA, EA
Chief Executive Officer

R. Ryan Falls

R. Ryan Falls, FSA, EA, MAAA
Senior Consultant

Brad Stewart

Brad Stewart, ASA, EA, MAAA
Consultant

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. This change was and to $48,000 and $30,000 for 1996-97. The member contribution rate for these made for both current and future retirees. 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%

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.

APPENDIX II (Continued)

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 III

SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS

Appendix III
Summary of Actuarial Assumptions and Methods

I. *Valuation Date*

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. *Actuarial Cost Method*

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% net 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 (1)	Service-Related Component (2)	Total Salary Increase Rate (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.

Appendix III (Continued)

B. Demographic Assumptions

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%.

Mortality Improvement: 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 2015 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 2015 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 2015 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. <u>Other Assumptions</u>

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: A retirement plan that is not a Defined Contribution Plan. Typically a defined benefit plan is one in which benefits are defined by a formula applied to the member's compensation and/or years of service.

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.

Appendix IV (Continued)

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.