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TEACHERS'
Retirement System
TRS
KENTUCKY

Teachers' Retirement System of the State of Kentucky Report of the Actuary on the Annual Valuation

Prepared as of June 30, 2018

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November 12, 2018

Board of Trustees
Teachers' Retirement System of the
State of Kentucky
479 Versailles Road
Frankfort, KY 40601-3800

Members of the Board:

Section 161.400 of the law governing the operation of the Teachers' Retirement System of the State of Kentucky provides that the actuary shall make an actuarial valuation of the System. We have submitted the results of the annual actuarial valuation prepared as of June 30, 2018. While not verifying the data at source, the actuary performed tests for consistency and reasonability. The combined member and state contribution rates as a percentage of payroll for the fiscal year ending June 30, 2021 required to support the total benefits of the System are as follows:

Group	Combined Member and State Contribution Requirement
University members hired before July 1, 2008	35.60%
University members hired on or after July 1, 2008	36.60%
Non-University members hired before July 1, 2008	38.56%
Non-University members hired on or after July 1, 2008	39.56%

These rates represent an increase since the previous valuation in the total Pension actuarially determined employer contribution rates (ADEC) of 0.05% of payroll for the fiscal year ending June 30, 2021.

A breakdown of the changes in the components of the ADEC are as follows:

- a decrease in the expected state special appropriation from 3.00% to 2.89%, or 0.11% of payroll
- an increase in the amount required for life insurance benefits from 0.05% to 0.06%, or 0.01% of payroll
- the additional required increase of 0.17%, from 14.10% to 14.27%

The financing objective of the System is that contribution rates will remain relatively level over time as a percentage of payroll. The promised benefits of the System are included in the actuarially calculated contribution rates which are developed using the entry age normal cost method.

Five-year market related value of plan assets is used for actuarial valuation purposes. Gains and losses are reflected in the total unfunded actuarial accrued liability that is being amortized by regular annual contributions as a level percentage of payroll in accordance with the funding policy adopted by the Board, on the assumption that payroll will increase by 3.5% annually. The assumptions recommended by the actuary and adopted by the Board are reasonably related to the experience under the System and to reasonable expectations of anticipated experience under the System.

We have prepared the trend information shown in the Schedule of Funding Progress in the Financial Section of the Annual Report and Schedule A, Schedule B, Schedule C, Solvency Test and Analysis of Financial Experience shown in the Actuarial Section of the Annual Report.

This is to certify that the independent consulting actuary is a member of the American Academy of Actuaries and has experience in performing valuations for public retirement systems, that the assumptions and methods used for funding purposes meet the parameters set by Actuarial Standards of Practice, and that the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures, based on the current provisions of the retirement system and on actuarial assumptions that are internally consistent and reasonably based on the actual experience of the System.

Future actuarial results may differ significantly from the current results 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; 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 plan’s funded status); and changes in plan provisions or applicable law. Since the potential impact of such factors is outside the scope of a normal annual actuarial valuation, an analysis of the range of results is not presented herein.

This actuarial valuation was performed to determine the recommended funding amount for the System. The asset values used to determine unfunded actuarial accrued liabilities and funded ratios are not market values but less volatile market related values. A smoothing technique is applied to market values to determine the market-related values. The unfunded actuarial accrued liability amounts and funded ratios using the market value of assets would be different. The interest rate used for determining liabilities is based on the expected return of assets. Therefore, liability amounts in this report cannot be used to assess a settlement of the obligation.

In our opinion, the System has not been funded on an actuarially sound basis since, historically, the full actuarially determined contributions were not made by the employer. However, an additional appropriation of $474.7 million was made during fiscal year 2018 and it is our understanding that the state budget includes additional appropriations to the pension plan for fiscal years 2019 and 2020. If contributions by the employer to the System in subsequent fiscal years are less than those required, the assets are expected to become insufficient to pay promised benefits. However, assuming that contributions to the System are made by the employer and state from year to year in the future at rates recommended on the basis of the successive actuarial valuations, the continued sufficiency of the assets to provide the benefits called for under the System may be safely anticipated.

Respectfully submitted,

Edward J. Koebel

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Principal and Consulting Actuary

Cathy Turcot

Cathy Turcot
Principal and Managing Director

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Section I – Summary of Principal Results

1. For convenience of reference, the principal results of the valuation and a comparison with the results of the previous valuation are summarized below (all dollar amounts are $1,000's):

Valuation Date	June 30, 2018	June 30, 2017
Number of active members	72,205	72,130
Annual salaries	$ 3,605,116	$ 3,563,584
Number of annuitants and beneficiaries	54,377	52,966
Annual allowances	$ 2,043,518	$ 1,953,464
Assets:		
Market value	$ 19,981,633	$ 18,707,699
Actuarial value	19,496,056	18,514,638
Actuarial Accrued Liability	$ 33,795,671	$ 32,819,887
Unfunded Actuarial Accrued Liability (UAAL)	$ 14,299,615	$ 14,305,249
Funded Ratio based on Actuarial Value of Assets	57.7%	56.4%
Amortization period (years)	26.5	27.4

Contribution rates are shown separately for university and non-university members on the following pages.

CONTRIBUTION RATES FOR UNIVERSITY MEMBERS

Valuation Date	**June 30, 2018**		**June 30, 2017**	
For fiscal year ending:	**June 30, 2021**		**June 30, 2020**	
	Members hired before 7/1/2008	**Members on and after 7/1/2008**	**Members hired before 7/1/2008**	**Members on and after 7/1/2008**
Pension Plan:				
Normal	10.690%	10.690%	10.800%	10.800%
Actuarial Accrued Liability	24.910	25.910	24.750	25.750
Total	35.600%	36.600%	35.550%	36.550%
Member	7.625%	7.625%	7.625%	7.625%
State	27.975	28.975	27.925	28.925
Total	35.600%	36.600%	35.550%	36.550%
Life Insurance Fund:				
State	0.060%	0.060%	0.050%	0.050%
Medical Insurance Fund:				
Member	2.775%	2.775%	2.775%	2.775%
State Match	2.775	1.775	2.775	1.775
Total	5.550%	4.550%	5.550%	4.550%
Total Contributions	41.210%	41.210%	41.150%	41.150%
Member Statutory	10.400%	10.400%	10.400%	10.400%
State Statutory	13.650	13.650	13.650	13.650
Required Increase	14.270	14.270	14.100	14.100
State Special	2.890	2.890	3.000	3.000
Total	41.210%	41.210%	41.150%	41.150%

CONTRIBUTION RATES FOR NON-UNIVERSITY MEMBERS

Valuation Date	**June 30, 2018**		**June 30, 2017**	
For fiscal year ending:	**June 30, 2021**		**June 30, 2020**	
	Members hired before 7/1/2008	**Members on and after 7/1/2008**	**Members hired before 7/1/2008**	**Members on and after 7/1/2008**
Pension Plan:				
Normal	14.760%	14.760%	14.840%	14.840%
Accrued liability	23.800	24.800	23.670	24.670
Total	38.560%	39.560%	38.510%	39.510%
Member	9.105%	9.105%	9.105%	9.105%
State	29.455	30.455	29.405	30.405
Total	38.560%	39.560%	38.510%	39.510%
Life Insurance Fund:				
State	0.060%	0.060%	0.050%	0.050%
Medical Insurance Fund:				
Member	3.750%	3.750%	3.750%	3.750%
State Match	3.750	2.750	3.750	2.750
Total	7.500%	6.500%	7.500%	6.500%
Total Contributions	46.120%	46.120%	46.060%	46.060%
Member Statutory	12.855%	12.855%	12.855%	12.855%
State Statutory	16.105	16.105	16.105	16.105
Required Increase	14.270	14.270	14.100	14.100
State Special	2.890	2.890	3.000	3.000
Total	46.120%	46.120%	46.060%	46.060%

2. The valuation includes only the assets and liabilities associated with the pension plan. The valuation of the Medical Insurance Fund and the Active and Retired Life Insurance Benefits will be prepared separately.
3. Comments on the valuation results as of June 30, 2018 are given in Section IV and further discussion of the contribution levels is set out in Sections V and VI.
4. Schedule B shows the development of the actuarial value of assets. The assumed investment rate of return is 7.50%. Schedule D of this report outlines the full set of actuarial assumptions and methods employed in the current valuation. There have been no changes since the previous valuation.
5. Provisions of the System, as summarized in Schedule F, were taken into account in the current valuation. There have been no changes since the previous valuation.
6. The funded ratio shown in the Summary of Principal Results, is the ratio of actuarial value of assets to the actuarial accrued liability. The funded status would be different based on the market value of assets. The funded ratio is an indication of progress in funding the promised benefits. Since the ratio is less than 100%, there is a need for additional contributions toward the payment of the unfunded actuarial accrued liability. In addition, this funded ratio does not have any relationship to measuring the sufficiency if the plan had to settle its liabilities.

Section II – Membership Data

1. Data regarding the membership of the System for use as a basis of the valuation were furnished by the Retirement System office. The following table shows the number of active members and their annual salaries as of June 30, 2018 on the basis of which the valuation was prepared.

GROUP	NUMBER	ANNUAL SALARIES ($1,000's)
University hired before 7/1/2008	1,578	$ 118,570
University hired after 7/1/2008	1,579	83,582
Non-University Full Time hired before 7/1/2008	34,000	2,259,772
Non-University Full Time hired after 7/1/2008	22,526	1,065,810
Non-University Part Time hired before 7/1/2008	2,098	18,041
Non-University Part Time hired after 7/1/2008	10,424	59,341
Total	72,205	$ 3,605,116

2. The following table shows the number and annual retirement allowances payable to annuitants and beneficiaries on the roll of the Retirement System as of the valuation date.

THE NUMBER AND ANNUAL RETIREMENT ALLOWANCES OF ANNUITANTS AND BENEFICIARIES ON THE ROLL AS OF JUNE 30, 2018

GROUP	NUMBER	ANNUAL RETIREMENT ALLOWANCES[1] ($1,000's)
Service Retirements	47,495	$ 1,863,635
Disability Retirements	2,831	85,270
Beneficiaries of Deceased Members	4,051	94,613
Total	54,377	$ 2,043,518

[1] Includes cost-of-living adjustments effective through July 1, 2018.

In addition, there are 8,814 terminated vested employees entitled to benefits in the future and 44,031 inactive non-vested members.

3. Table 1 of Schedule G shows a distribution by age and years of service of the number and annual salaries of active members included in the valuation, while Table 2 shows the number and annual retirement allowances of annuitants and beneficiaries included in the valuation, distributed by age.

Section III – Assets

1. As of June 30, 2018, the market value of Pension Plan assets for valuation purposes held by the System amounted to $19,981,633,096. This value excludes assets in the Medical Insurance Fund, the 403(b) Program Reserve Fund, and the Life Insurance Fund, which are not included in the assets used for Pension Plan valuation purposes. The estimated market investment return for the plan year was 10.50%. Schedule C shows the receipts and disbursements for the year preceding the valuation date and a reconciliation of the asset balances for the Pension Plan.
2. The five-year market related value of Pension Plan assets used for valuation purposes as of June 30, 2018 was $19,496,055,514. The estimated investment return for the plan year ending June 30, 2018 on an actuarial value of assets basis was 9.14%, compared to the assumed investment rate of return for the period of 7.50%. Schedule B shows the development of the actuarial value of assets as of June 30, 2018.

Section IV – Comments on Valuation

1. Schedule A of this report contains the valuation balance sheet which shows the present and prospective assets and liabilities of the System as of June 30, 2018. The valuation was prepared in accordance with the actuarial assumptions and the actuarial cost method, which are described in Schedule D and Schedule E.
2. The valuation balance sheet shows that the System has total prospective liabilities of $16,515,254,593 for benefits expected to be paid on account of the present active members. The liability on account of benefits payable to annuitants and beneficiaries amounts to $21,525,543,928 of which $720,598,026 is for special appropriations remaining to be made toward funding ad hoc increases and sick leave allowances granted after 1981. The liability for benefits expected to be paid to inactive members and to members entitled to deferred vested benefits is $396,936,901. The total prospective liabilities of the System amounts to $38,437,735,422. Against these liabilities, the System has present assets for valuation purposes of $19,496,055,514. When this amount is deducted from the total liabilities of $38,437,735,422, there remains $18,941,679,908 as the present value contributions to be made in the future.
3. The employer's contributions to the System consist of normal contributions and actuarial accrued liability contributions. The valuation indicates that employer normal contributions at the rate of 10.69% of payroll for University and 14.76% of payroll for Non-University are required.
4. Prospective normal employer and employee contributions have a present value of $4,642,064,420. When this amount is subtracted from $18,941,679,908, which is the present value of the total future contributions to be made by the employer, there remains $14,299,615,488 as the amount of future unfunded actuarial accrued liability contributions.
5. The unfunded actuarial accrued liability decreased by approximately $5.6 million for the plan year ending June 30, 2018 and the funding ratio increased from 56.4% to 57.7%. See Section VII for a complete breakdown of the experience of the System.

Section V – Contributions Payable Under the System

1. Section 161.540 of the retirement law provides that each university member contribute 10.400% of annual salary to the System and each non-university member contribute 12.855% of annual salary. Of this amount, for each university member, 2.775% is paid to the Medical Insurance Fund for medical benefits and for each non-university member, 3.75% is paid to the Medical Insurance Fund for medical benefits. The remainder, 7.625% for university members and 9.105% for non-university members, is applicable for the retirement benefits taken into account in the valuation.
2. Section 161.550 provides that the State will match a portion of the member contributions and contribute a supplemental 3.25% of members' salaries towards discharging the System's unfunded obligations. Additional contributions are made to the Medical Insurance Fund as required under 161.550(3).
3. Therefore for university members, 10.875% of the salaries of active members who become members before July 1, 2008 and 11.875% of the salaries of active members who become members on or after July 1, 2008 is funded by statute or supplemental funding for the Pension Plan and Life Insurance Fund. For non-university members, 12.355% of the salaries of active members who become members before July 1, 2008 and 13.355% of the salaries of active members who become members on or after July 1, 2008 is funded by statute or supplemental funding for the Pension Plan and Life Insurance Fund. Of these amounts, 0.06% of payroll will be allocated to the Life Insurance Fund. Based on the results of the valuation, an additional 14.27% of payroll for both university and non-university will be required in order to maintain the amortization of the unfunded actuarial accrued liability of the Pension Plan based on the funding policy adopted by the Board. An additional special appropriation of 2.89% of total payroll will be made by the State. Therefore, the total actuarially determined employer contribution rate to the Pension Plan is 27.975% for university members who become members before July 1, 2008 and 28.975% for university members who become members on or after July 1, 2008. The total actuarially determined employer contribution rate to the Pension Plan is 29.455% for non-university members who become members before July 1, 2008 and 30.455% for non-university members who become members on or after July 1, 2008. The total member and employer contribution rates to the Pension Plan are shown in the following tables.

Section V – Contributions Payable Under the System

CONTRIBUTION RATES BY SOURCE

UNIVERSITY

	Members hired before 7/1/2008	Members hired on and after 7/1/2008
Member		
Statutory Total	10.400%	10.400%
Statutory Medical Insurance Fund	(2.775)	(2.775)
Contribution to Pension Plan	7.625%	7.625%
Employer		
Statutory Matching Total	10.400%	10.400%
Statutory Medical Insurance Fund	(2.775)	(1.775)
Supplemental Funding	3.250	3.250
Subtotal	10.875%	11.875%
Life Insurance	(0.060)%	(0.060)%
Additional to Comply with Board Funding Policy	14.270	14.270
Special Appropriation	2.890	2.890
Contribution to Pension Plan	27.975%	28.975%
Total Contribution to Pension Plan	35.600%	36.600%

Section V – Contributions Payable Under the System

CONTRIBUTION RATES BY SOURCE

NON-UNIVERSITY

	Members hired before 7/1/2008	Members hired on and after 7/1/2008
Member		
Statutory Total	12.855%	12.855%
Statutory Medical Insurance Fund	(3.750)	(3.750)
Contribution to Pension Plan	9.105%	9.105%
Employer		
Statutory Matching Total	12.855%	12.855%
Statutory Medical Insurance Fund	(3.750)	(2.750)
Supplemental Funding	3.250	3.250
Subtotal	12.355%	13.355%
Life Insurance	(0.060)%	(0.060)%
Additional to Comply with Board Funding Policy	14.270	14.270
Special Appropriation	2.890	2.890
Contribution to Pension Plan	29.455%	30.455%
Total Contribution to Pension Plan	38.560%	39.560%

4. The valuation indicates that normal contributions at the rate of 10.69% of active university members' salaries and 14.76% of active non-university members' salaries are required. The difference between the total contribution rate and the normal rate remains to be applied toward the liquidation of the unfunded actuarial accrued liability. This actuarial accrued liability rate, based on the assumptions set forth in the Board's funding policy, is 24.91% for university members hired before July 1, 2008, 25.91% for university members hired on and after July 1, 2008, 23.80% for non-university members hired before July 1, 2008, and 24.80% for non-university members hired on and after July 1, 2008. These rates include special appropriations of 2.89% of payroll to be made by the State. These rates are shown in the following table:

ACTUARIALLY DETERMINED CONTRIBUTION RATES

RATE	PERCENTAGE OF ACTIVE MEMBERS' SALARIES			
	UNIVERSITY		NON-UNIVERSITY	
	Members hired before 7/1/2008	Members hired on and after 7/1/2008	Members hired before 7/1/2008	Members hired on and after 7/1/2008
Normal	10.69%	10.69%	14.76%	14.76%
Actuarial Accrued liability*	24.91	25.91	23.80	24.80
Total	35.60%	36.60%	38.56%	39.56%

* Includes special appropriations of 2.89% of payroll to be made by the State.

5. The following table shows the components of the total Unfunded Actuarial Accrued Liability (UAAL) and the derivation of the UAAL contribution rate in accordance with the funding policy:

TOTAL UAAL AND UAAL CONTRIBUTION PAYMENT
(Dollar amounts in thousands)

	ORIGINAL UAAL	CURRENT UAAL	REMAINING AMORTIZATION PERIOD (YEARS)	AMORTIZATION PAYMENT
Legacy	$14,010,205	$14,930,003	26	$920,415
New Incremental 6/30/2015	(351,610)	(349,480)	17	(28,426)
New Incremental 6/30/2016	340,766	339,694	18	26,539
New Incremental 6/30/2017	(428,468)	(428,362)	19	(32,241)
New Incremental 6/30/2018	(192,240)	(192,240)	20	(13,976)
Total UAAL		$14,299,615		$872,311
Blended amortization period (years)				26.5

Section VI – Comments on Level of Funding

1. Our calculations indicate that the contribution rates shown in the previous section will be sufficient to cover the benefits of the System, the annual 1.5% increases in the allowances of retired members and beneficiaries, and the liabilities for ad hoc increases and sick leave allowances granted after 1981.
2. The valuation indicates that the present statutory contribution rates, supplemental funding and special appropriations, if continued at the current level percentage, along with an additional required contribution of 14.27%, are sufficient to meet the cost of benefits currently accruing and provide for the amortization of the unfunded actuarial accrued liability in accordance with the Board funding policy. However, as existing special contributions expire, the statutory contributions or supplemental funding may be required to increase as an equal percentage of payroll.

3. There are no excess assets or contributions available to provide additional benefits, and there is a cumulative increase in the required employer contribution of 14.27% of payroll for the fiscal year ending June 30, 2021, as shown in the following table:

Valuation Date	Fiscal Year	Increase/ (Decrease)	Cumulative Increase	Amount
June 30, 2004	June 30, 2007	0.11%	0.11%	$ 3,174,600
June 30, 2005	June 30, 2008	1.21	1.32	38,965,900
June 30, 2006	June 30, 2009	0.56	1.88	60,499,800
June 30, 2007	June 30, 2010	0.58	2.46	82,331,200
June 30, 2008	June 30, 2011	1.13	3.59	121,457,000
June 30, 2009	June 30, 2012	2.22	5.81	208,649,000
June 30, 2010	June 30, 2013	1.46	7.27	260,980,000
June 30, 2011	June 30, 2014	0.75	8.02	299,420,000
June 30, 2012	June 30, 2015	2.40	10.42	386,400,000
June 30, 2013	June 30, 2016	2.55	12.97	487,400,000
June 30, 2014	June 30, 2017	0.83	13.80	520,372,000
June 30, 2015	June 30, 2018	(0.31)	13.49	512,883,000
June 30, 2016	June 30, 2019	1.12	14.61	553,597,000
June 30, 2017	June 30, 2020	(0.51)	14.10	538,253,000
June 30, 2018	June 30, 2021	0.17	14.27	551,092,000

In addition, as existing special contributions expire, the statutory contributions or supplemental funding may be required to increase as an equal percentage of payroll, in order to amortize the unfunded actuarial accrued liability in accordance with the Board funding policy. Any further benefit improvements must be accompanied by the entire additional contributions necessary to support the benefits.

Section VII – Analysis of Financial Experience

The following table shows the estimated gain or loss from various factors that resulted in a decrease of $5,632,843 in the unfunded actuarial accrued liability from $14,305,248,331 to $14,299,615,488 during the year ending June 30, 2018. The decrease in the unfunded actuarial accrued liability was primarily due to gains for the investment return on an actuarial value basis that was greater than expected and salary increases that were less than assumed. In addition to these gains were small demographic gains and losses due to turnover, retirement and mortality.

ANALYSIS OF FINANCIAL EXPERIENCE
(Dollar amounts in thousands)

ITEM	AMOUNT OF INCREASE/ (DECREASE)
Interest (7.50%) added to previous unfunded actuarial accrued liability	$ 1,072,894
Expected actuarial accrued liability contribution	(888,427)
Loss due to Contribution Shortfall and Timing	8,540
Experience:	
Valuation asset growth	(297,572)
Pensioners' mortality	58,828
Turnover and retirements	72,847
New entrants	40,380
Salary increases	(73,123)
Amendments	0
Assumption changes	0
Method changes	0
Total	$ (5,633)

Section VIII – Accounting Information

The information required under Governmental Accounting Standards Board (GASB) Statements No. 67 and 68 will be issued in separate reports. The following information is provided for informational purposes only.

1. The following is a distribution of the number of employees by type of membership.

NUMBER OF ACTIVE AND RETIRED MEMBERS
AS OF JUNE 30, 2018

GROUP	NUMBER
Retirees and beneficiaries currently receiving benefits	54,377
Terminated vested employees entitled to benefits but not yet receiving benefits	8,814
Inactive non-vested members	44,031
Active plan members	72,205
Total	179,427

2. The schedule of funding progress is shown below.

SCHEDULE OF FUNDING PROGRESS
(Dollar amounts in thousands)

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded AAL (UAAL) (b - a)	Funded Ratio (a / b)	Annual Salaries (c)	UAAL as a Percentage of Annual Salaries ((b - a) / c)
6/30/2013	$14,962,758	$28,817,232	$ 13,854,474	51.9%	$3,480,066	398.1%
6/30/2014*	16,174,199	30,184,404	14,010,205	53.6	3,486,327	401.9
6/30/2015	17,219,520	31,149,962	13,930,442	55.3	3,515,113	396.3
6/30/2016*	17,496,894	32,028,227	14,531,333	54.6	3,537,226	410.8
6/30/2017	18,514,638	32,819,887	14,305,249	56.4	3,563,584	401.4
6/30/2018	19,496,056	33,795,671	14,299,615	57.7	3,605,116	396.6

* Reflects change in assumptions

3. The information presented above was determined as part of the actuarial valuation at June 30, 2018. Additional information as of the latest actuarial valuation follows.

Valuation date	6/30/2018
Actuarial cost method	Entry Age
Amortization method	Level percent of pay, closed
Remaining amortization period	26.5 years
Asset valuation method	5-year smoothed market
Actuarial assumptions:	
Investment Rate of Return*	7.50%
Projected salary Increases**	3.50% - 7.30%
Cost-of-living adjustments	1.50% Annually
*Includes price inflation at	3.00%
**Includes wage inflation at	3.50%

SCHEDULE OF EMPLOYER CONTRIBUTIONS

Fiscal Year Ending June 30	Actuarially Determined Employer Contributions	Actual Employer Contributions	Percentage Contributed
2013	$ 802,984,644	$ 568,233,446	71%
2014	823,446,156	563,326,249	68
2015	913,653,854	559,579,290	61
2016	999,270,174	565,454,590	57
2017	1,076,617,093	1,060,719,993	99
2018	1,080,892,201	1,048,671,201	97

Section IX – Sensitivity Analysis

The valuation results are a projection of expected benefit payments based on the actuarial assumptions. Actual experience will differ from these assumptions, either increasing or decreasing liabilities and valuation results. The charts on the following pages provide a simple analysis on how the costs are sensitive to changes in the assumed discount rate, the assumed price inflation rate and the rate of wage inflation. The charts show the actuarial accrued liability, the unfunded actuarial accrued liability, the funded ratio and the employer contribution rate under each of the following scenarios:

- **TABLE 1** - The discount rate assumption sensitivity analysis shows the valuation results with the baseline discount rate assumption, 7.50%, together with an increase and a decrease of 1.00% in the discount rate. Under this scenario, the underlying price inflation rate assumption is held constant at 3.00% and the wage inflation assumption is held constant at 3.50%.

- **TABLE 2** - The price inflation assumption sensitivity analysis shows the valuation results with the baseline underlying price inflation rate assumption, 3.00%, together with decreases in the price inflation rate to 2.75% and 2.50%. Under this scenario, the decrease in the underlying price inflation rate assumption leads to corresponding decreases in the discount rate (7.25% and 7.00%, respectively), the wage inflation assumption (3.25% and 3.00%, respectively), and the assumed rates of salary increase for active members.

- **TABLE 3** - The wage inflation assumption sensitivity analysis shows the valuation results with the baseline underlying wage inflation assumption, 3.50%, together with decreases in the wage inflation assumption to 2.00% and 0.00%. Under this scenario, all other assumptions, including the individual member salary scale, are held constant so that the only impact is in the amortization of the unfunded actuarial accrued liability, leading to higher employer contribution rates.

Section IX – Sensitivity Analysis

TABLE 1

TEACHERS' RETIREMENT SYSTEM OF KENTUCKY
ASSUMED DISCOUNT RATE SENSITIVITY ANALYSIS AS OF JUNE 30, 2018

($1,000's)

	Decrease Discount Rate	Valuation Results	Increase Discount Rate
Actuarial Accrued Liability	$ 37,702,021	$ 33,795,671	$ 30,519,411
Actuarial Value of Assets	19,496,056	19,496,056	19,496,056
Unfunded Actuarial Accrued Liability	$ 18,205,965	$ 14,299,615	$ 11,023,355
Funded Ratio	51.7%	57.7%	63.9%
Employer ADEC – University*	37.505%	28.975%	21.575%
Employer ADEC – Non-University*	38.985%	30.455%	23.055%
Discount Rate	6.50%	7.50%	8.50%
Wage Inflation Rate	3.50%	3.50%	3.50%
Price Inflation Rate	3.00%	3.00%	3.00%

* Less 1% for members hired before July 1, 2008.

TABLE 2

TEACHERS' RETIREMENT SYSTEM OF KENTUCKY
PRICE INFLATION ASSUMPTION SENSITIVITY ANALYSIS AS OF JUNE 30, 2018

($1,000's)

	Valuation Results	Decrease Inflation Rate 25 basis points	Decrease Inflation Rate 50 basis points
Actuarial Accrued Liability	$ 33,795,671	$ 34,587,658	$ 35,413,014
Actuarial Value of Assets	19,496,056	19,496,056	19,496,056
Unfunded Actuarial Accrued Liability	$ 14,299,615	$ 15,091,602	$ 15,916,958
Funded Ratio	57.7%	56.4%	55.1%
Employer ADEC – University*	28.975%	31.035%	33.175%
Employer ADEC – Non-University*	30.455%	32.515%	34.655%
Discount Rate	7.50%	7.25%	7.00%
Wage Inflation Rate	3.50%	3.25%	3.00%
Price Inflation Rate	3.00%	2.75%	2.50%

* Less 1% for members hired before July 1, 2008.

TABLE 3

TEACHERS' RETIREMENT SYSTEM OF KENTUCKY
WAGE INFLATION ASSUMPTION SENSITIVITY ANALYSIS AS OF JUNE 30, 2018
($1,000's)

	Valuation Results	Decrease Wage Inflation to 2%	No Wage Inflation
Actuarial Accrued Liability	$ 33,795,671	$ 33,795,671	$ 32,795,671
Actuarial Value of Assets	19,496,056	19,496,056	19,496,056
Unfunded Actuarial Accrued Liability	$ 14,299,615	$ 14,299,615	$ 14,299,615
Funded Ratio	57.7%	57.7%	57.7%
Employer ADEC – University*	28.975%	33.255%	39.655%
Employer ADEC – Non-University*	30.455%	34.735%	41.135%
Discount Rate	7.50%	7.50%	7.50%
Wage Inflation Rate	3.50%	2.00%	0.00%
Price Inflation Rate	3.00%	3.00%	3.00%

* Less 1% for members hired before July 1, 2008.

Schedule A – Valuation Balance Sheet and Solvency Test

SHOWING THE PRESENT AND PROSPECTIVE ASSETS AND LIABILITIES
AS OF JUNE 30, 2018
(Dollar amounts in thousands)

	ACTUARIAL LIABILITIES		
(1)	Present value of prospective benefits payable on account of present active members		
	- Service retirement benefits	$ 15,493,983	
	- Disability retirement benefits	636,767	
	- Death and survivor benefits	127,040	
	- Refunds of member contributions	257,464	
	Total		$ 16,515,254
(2)	Present value of prospective benefits payable on account of present retired and disabled members, and beneficiaries of deceased members		
	- Service retirement benefits	$ 19,903,893	
	- Disability retirement benefits	824,297	
	- Death and survivor benefits	797,354	
	Total		$ 21,525,544
(3)	Present value of prospective benefits payable on account of inactive members and members entitled to deferred vested benefits		$ 396,937
(4)	TOTAL ACTUARIAL LIABILITIES		$ 38,437,735
	PRESENT AND PROSPECTIVE ASSETS		
(5)	Actuarial value of assets		$ 19,496,056
(6)	Present value of total future contributions = (4)-(5)	$ 18,941,679	
(7)	Present value of future member contributions and employer normal contributions		$ 4,642,064
(8)	Prospective unfunded actuarial accrued liability contributions = (6)-(7)		$ 14,299,615
(9)	TOTAL PRESENT AND PROSPECTIVE ASSETS		$ 38,437,735

Schedule A – Valuation Balance Sheet and Solvency Test

SOLVENCY TEST
(Dollar amounts in millions)

	Aggregate Actuarial Accrued Liability For				Portion of Accrued Liabilities Covered by Assets		
Valuation Date	(1) Active Member Contributions	(2) Retirants And Beneficiaries	(3) Active Members (Employer Financed Portion)	Valuation Assets	(1)	(2)	(3)
6/30/2013	$3,514.4	$17,716.4	$7,586.5	$14,962.8	100%	65%	0%
6/30/2014	3,629.7	18,676.3	7,878.3	16,174.2	100	67	0
6/30/2015	3,700.6	19,522.5	7,926.8	17,219.5	100	69	0
6/30/2016	3,756.0	20,416.4	7,855.8	17,496.9	100	67	0
6/30/2017	3,849.9	21,108.0	7,862.1	18,514.6	100	69	0
6/30/2018	3,927.8	21,922.5	7,945.4	19,496.1	100	71	0

Schedule B – Development of the Actuarial Value of Assets

AS OF JUNE 30, 2018

(1)	Actuarial Value of Assets Beginning of Year		$ 18,514,638,263
(2)	Net Position at Market Value at End of Year		$ 19,981,633,096
(3)	Net Position at Market Value at Beginning of Year		$ 18,707,699,025
(4)	Cash Flow		
	a.	Contributions	$ 1,367,798,288
	b.	Benefit Payments	2,035,689,755
	c.	Administrative Expense	11,388,493
	d.	Net: (4)a – (4)b – (4)c	$ (679,279,960)
(5)	Investment Income		
	a.	Market total: (2) – (3) – (4)d	$ 1,953,214,031
	b.	Assumed Rate	7.50%
	c.	Amount for Immediate Recognition: [(3) x (5)b] + [(4)d x (5)b x 0.5]	$ 1,377,604,428
	d.	Amount for Phased-In Recognition: (5)a – (5)c	$ 575,609,603
(6)	Phased-In Recognition of Investment Income		
	a.	Current Year: 0.20 x (5)d	$ 115,121,921
	b.	First Prior Year	247,314,724
	c.	Second Prior Year	(312,346,803)
	d.	Third Prior Year	(92,160,668)
	e.	Fourth Prior Year	325,163,609
	f.	Total Recognized Investment Gain	$ 283,092,783
(7)	Actuarial Value of Assets End of Year: (1) + (4)d + (5)c + (6)f		$ 19,496,055,514
(8)	Difference Between Market & Actuarial Values: (2) – (7)		$ 485,577,582
(9)	Net Investment Rate of Return on Actuarial Value:		9.14%

Schedule C – Summary of Receipts and Disbursements

SUMMARY OF RECEIPTS AND DISBURSEMENTS*
(Market Value)

	For the Year Ending	
	June 30, 2018	**June 30, 2017**
Receipts for the Year		
Contributions		
Members	$ 319,127,087	$ 313,625,434
Employers	1,048,671,201	1,060,719,993
Total	1,367,798,288	1,374,345,427
Net Investment Income	1,953,214,031	2,475,752,798
TOTAL	$ 3,321,012,319	$ 3,850,098,225
Disbursements for the Year		
Benefit Payments	$ 2,004,617,334	$ 1,918,612,128
Refunds to Members	31,072,421	26,305,240
Miscellaneous, including expenses	11,388,493	10,313,715
TOTAL	$ 2,047,078,248	$ 1,955,231,083
Excess of Receipts over Disbursements	$ 1,273,934,071	$ 1,894,867,142
Reconciliation of Net Position		
Net Position as of the Beginning of the Year	$ 18,707,699,025	$ 16,812,831,883
Excess of Receipts over Disbursements	1,273,934,071	1,894,867,142
Net Position as of the End of the Year	$ 19,981,633,096	$ 18,707,699,025
Net Investment Rate of Return on Market Value	10.5%	15.0%

* Excludes assets for Medical Insurance Fund, the 403(b) Program Reserve Fund and the Life Insurance Fund.

Schedule D – Outline of Actuarial Assumptions and Methods

The assumptions and methods used in the valuation were selected based on the actuarial experience study prepared as of June 30, 2015, submitted to and adopted by the Board on September 19, 2016.

INVESTMENT RATE OF RETURN: 7.50% per annum, compounded annually, including price inflation at 3.00% per annum.

SALARY INCREASES: Representative values of the assumed annual rates of future salary increases are as follows and include wage inflation at 3.50% per annum:

Age	Annual Rate
20	7.20%
25	6.40
30	5.40
35	4.70
40	4.20
45	3.80
50	3.70
55	3.50
60	3.50
65	3.50

SEPARATIONS FROM SERVICE: Representative values of the assumed annual rates of death, disability, withdrawal, service retirement and early retirement are as follows:

Males

	Annual Rate of						
			WITHDRAWAL			RETIREMENT	
			Service			Before 27 Years of Service	After 27 Years of Service*
Age	DEATH	DISABILITY	0 – 4	5 – 9	10+		
20	0.019%	0.01%	11.00%				
25	0.021	0.01	11.00	3.00%			
30	0.025	0.01	11.00	3.00	3.00%		
35	0.043	0.04	12.00	3.50	1.40		
40	0.060	0.09	12.00	4.50	1.40		
45	0.084	0.20	12.00	4.50	1.30		17.0%
50	0.119	0.30	14.00	4.50	1.90		17.0
55	0.202	0.58	15.00	4.50	2.40	5.0%	45.0
60	0.340	0.75	15.00	4.00	2.40	13.0	35.0
62	0.419	0.75	15.00	3.80	2.40	15.0	25.0
65	0.565	0.75	15.00	3.50	2.40	20.0	25.0
70	0.913	0.75	20.00	0.00	0.00	20.0	20.0
75	1.556	0.75	20.00	0.00	0.00	100.0	100.0

*Plus 7.5% in year when first eligible for unreduced retirement with 27 years of service.

Females

	Annual Rate of						
						RETIREMENT	
			WITHDRAWAL			Before	After
			Service			27 Years	27 Years
Age	DEATH	DISABILITY	0 – 4	5 – 9	10+	of Service	of Service*
20	0.007%	0.01%	9.00%				
25	0.008	0.01	9.00	4.00%			
30	0.010	0.03	12.00	4.00	1.65%		
35	0.018	0.06	12.00	4.00	1.50		
40	0.026	0.12	12.00	4.00	1.30		
45	0.042	0.25	13.00	4.00	1.20		15.0%
50	0.062	0.44	13.00	5.00	1.50		18.0
55	0.096	0.65	15.00	5.00	2.00	5.5%	50.0
60	0.157	0.85	15.00	5.00	2.00	14.0	40.0
62	0.197	0.85	15.00	4.60	2.00	14.0	40.0
65	0.287	0.85	15.00	4.00	2.00	22.0	35.0
70	0.495	0.85	15.00	0.00	0.00	20.0	35.0
75	0.831	0.85	15.00	0.00	0.00	100.0	100.0

*Plus 7.5% in year when first eligible for unreduced retirement with 27 years of service.

DEATHS AFTER RETIREMENT: The RP-2000 Combined Mortality Table projected to 2025 using scale BB (set forward two years for males and one year for females) is used for death after service retirement and beneficiaries. The RP-2000 Disabled Mortality Table (set forward two years for males and seven years for females) is used for death after disability retirement. There is a margin for future mortality improvement in the tables used by the System. Based on the results of the most recent experience study adopted by the Board on September 19, 2016, the numbers of expected future deaths are 15-19% less than the actual number of deaths that occurred during the study period for healthy retirees and 13-17% less than expected under the selected table for disabled retirees. Representative values of the assumed annual rates of death after service retirement and after disability retirement are shown below:

	Annual Rate of Death After			
	Service Retirement		Disability Retirement	
Age	Male	Female	Male	Female
45	0.1609%	0.1135%	2.3306%	1.2482%
50	0.2474	0.1718	2.9279	1.5650
55	0.4246	0.2658	3.4400	1.7807
60	0.6985	0.4409	3.5881	2.3164
65	1.1300	0.8100	3.8275	3.1687
70	1.8697	1.3739	4.7566	4.4032
75	3.2147	2.2899	6.3153	6.0857
80	5.5160	3.7551	8.3527	8.4679
85	9.5631	6.3873	10.9122	12.7572
90	17.2787	11.2476	17.2787	19.4718
95	27.1263	18.1190	27.1263	24.2074

Schedule D – Outline of Actuarial Assumptions and Methods

ASSETS: Five-year market related actuarial value, as developed in Schedule B. The actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected actuarial value of assets, based on the ultimate assumed valuation rate of return of 7.50%. The amount recognized each year is 20% of the difference between market value and expected actuarial value.

EXPENSE LOAD: None.

PERCENT MARRIED: 100%, with females 3 years younger than males.

LOADS: Unused sick leave: 2% of active liability

Schedule E – Actuarial Cost Method

1. The valuation is prepared on the projected benefit basis, under which the present value, at the interest rate assumed to be earned in the future (currently at 7.50%), of each active member's expected benefit at retirement or death is determined, based on his/her age, service, sex and compensation. The calculations take into account the probability of a member's death or termination of employment prior to becoming eligible for a benefit, as well as the possibility of his/her terminating with a service, disability or survivor's benefit. Future salary increases and post-retirement cost-of-living adjustments are also anticipated. The present value of the expected benefits payable on account of the active members is added to the present value of the expected future payments to retired members and beneficiaries and inactive members to obtain the present value of all expected benefits payable from the System on account of the present group of members and beneficiaries.
2. The employer contributions required to support the benefits of the System are determined following a level funding approach, and consist of a normal contribution and an actuarial accrued liability contribution.
3. The normal contribution is determined using the "entry age normal" method. Under this method, a calculation is made to determine the uniform and constant percentage rate of employer contribution which, if applied to the compensation of the average new member during the entire period of his/her anticipated covered service, would be required in addition to the contributions of the member to meet the cost of all benefits payable on his/her behalf.
4. The unfunded actuarial accrued liability is determined by subtracting the present value of prospective employer normal contributions and member contributions, together with the current actuarial value of assets held, from the present value of expected benefits to be paid from the System.

Schedule F – Summary of Main System Provisions

AS INTERPRETED FOR VALUATION PURPOSES

The Teachers' Retirement System of the State of Kentucky was established on July 1, 1940. The valuation took into account amendments to the System effective through June 30, 2018. The following summary describes the main benefit and contribution provisions of the System as interpreted for the valuation.

1 - DEFINITIONS

"Final average salary" means the average of the five highest annual salaries which the member has received for service in a covered position and on which the member has made contributions or on which the public board, institution or agency has picked up the member contributions. For a member who retires after attaining age 55 with 27 years of service, "final average salary" means the average of the three highest annual salaries.

2 - BENEFITS

Service Retirement Allowance

Members Before 7/1/2008

Condition for Allowance	Completion of 27 years of service or attainment of age 55 and 5 years of service.
Amount of Allowance	The annual retirement allowance for non-university members is equal to: (a) 2.0% of final average salary multiplied by service before July 1, 1983, plus (b) 2.5% of final average salary multiplied by service after July 1, 1983. (c) For individuals who become members of the Retirement System on or after July 1, 2002 and have less than 10 years of service at retirement, the retirement allowance is 2.0% of final average salary multiplied by service. If, however, they have 10 or more years, they receive a benefit percentage of 2.5% for all years of service up to 30 years.

(d) For members retiring on or after July 1, 2004, the retirement allowance formula is 3.0% of final average salary for each year of service credit earned in excess of 30 years.

The annual retirement allowance for university members is equal to 2.0% of final average salary multiplied by all years of service.

For all members, the annual allowance is reduced by 5% per year from the earlier of age 60 or the date the member would have completed 27 years of service.

The minimum annual service allowance for all members is $440 multiplied by credited service.

Members on and after 7/1/2008

Condition for Retirement

Completion of 27 years of service, attainment of age 60 and 5 years of service or attainment of age 55 and 10 years of service.

Amount of Allowance

The annual retirement allowance for non-university members is equal to:

1.7% of final average salary if service is 10 years or less.
2.0% of final average salary if service is greater than 10 years and no more than 20 years.
2.3% of final average salary if service is greater than 20 years but no more than 26 years.
2.5% of final average salary if service is greater than 26 years but no more than 30 years.
3.0% of final average salary for years of service greater than 30 years.

The annual retirement allowance for university members is equal to:

1.5% of final average salary if service is 10 years or less.
1.7% of final average salary if service is greater than 10 years and no more than 20 years.
1.85% of final average salary if service is greater than 20 years but less than 27 years.
2.0% of final average salary if service is greater than or equal to 27 years.

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For all members, the annual allowance is reduced by 6% per year from the earlier of age 60 or the date the member would have completed 27 years of service.

Schedule F – Summary of Main System Provisions

Disability Retirement Allowance	
Condition for Allowance	Totally and permanently incapable of being employed as a teacher and under 27 years of service but after completing 5 years of service.
Amount of Allowance	The disability allowance is equal to 60% of the member's final average salary. The disability allowance is payable over an entitlement period equal to 25% of the service credited to the member at the date of disability or five years, whichever is longer. After the disability entitlement period has expired and if the member remains disabled, he will be retired under service retirement. The service retirement allowance will be computed with service credit given for the period of disability retirement. The allowance will not be less than $6,000 per year. The service retirement allowance will not be reduced for commencement of the allowance before age 60 or the completion of 27 years of service.
Benefits Payable on Separation from Service	Any member who ceases to be in service is entitled to receive his contributions with allowable interest. A member who has completed 5 years of creditable service and leaves his contributions with the System may be continued in the membership of the System after separation from service, and file application for service retirement after the attainment of age 60.
Life Insurance	A separate Life Insurance fund has been created as of June 30, 2000 to pay benefits on behalf of deceased TRS active and retired members.

Schedule F – Summary of Main System Provisions

Death Benefits

A surviving spouse of an active member with less than 10 years of service may elect to receive an annual allowance of $2,880 except that if income from other sources exceeds $6,600 per year the annual allowance will be $2,160.

A surviving spouse of an active member with 10 or more years of service may elect to receive an allowance which is the actuarial equivalent of the allowance the deceased member would have received upon retirement. The allowance will commence on the date the deceased member would have been eligible for service retirement and will be payable during the life of the spouse.

If the deceased member is survived by unmarried children under age 18 the following schedule of annual allowances applies:

Number of Children	Annual Allowance
1	$ 2,400
2	4,080
3	4,800
4 or more	5,280

The allowances are payable until a child attains age 18, or age 23 if a full-time student.

If the member has no eligible survivor, a refund of his accumulated contributions is payable to his estate.

Options

In lieu of the regular Option 1, a retirement allowance payable in the form of a life annuity with refundable balance, any member before retirement may elect to receive a reduced allowance which is actuarially equivalent to the full allowance, in one of the following forms:

Option 2. A single life annuity payable during the member's lifetime with payments for 10 years certain.

Option 3. At the death of the member his allowance is continued throughout the life of his beneficiary.

Option 3(a). At the death of the beneficiary designated by the member under Option 3, the member's benefit will revert to what would have been paid had he not selected an option.

Option 4. At the death of the member one half of his allowance is continued throughout the life of his beneficiary.

Schedule F – Summary of Main System Provisions

	Option 4(a). At the death of the beneficiary designated by the member under Option 4, the member's benefit will revert to what would have been paid had he not selected an option.
Post-Retirement Adjustments	The retirement allowance of each retired member and of each beneficiary shall be increased by 1.50% each July 1.

3 - CONTRIBUTIONS

Member Contributions	University members contribute 7.625% of salary to the Retirement System. Non-university members contribute 9.105% of salary to the Retirement System. Member contributions are picked up by the employer.

Schedule G – Tables of Employee Data

TABLE 1
AGE – SERVICE TABLE

Distribution of Active Members as of June 30, 2018 by Age and Service Groups

Attained Age	Completed Years of Service								
	0 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	>= 35	Total
24 & under	3,356								3,356
Total Pay	73,197,998								73,197,998
Avg. Pay	21,811								21,811
25 to 29	5,728	1,663	5						7,396
Total Pay	203,495,638	82,568,556	187,852						286,252,046
Avg. Pay	35,526	49,650	37,570						38,704
30 to 34	2,675	4,547	1,612	3					8,837
Total Pay	86,293,957	232,507,874	93,615,745	171,059					412,588,635
Avg. Pay	32,259	51,134	58,074	57,020					46,689
35 to 39	2,254	2,127	4,670	1,452	8				10,511
Total Pay	66,909,314	110,685,191	282,452,313	94,329,491	434,996				554,811,305
Avg. Pay	29,685	52,038	60,482	64,965	54,375				52,784
40 to 44	1,783	1,360	2,099	4,041	1,099	6			10,388
Total Pay	50,536,837	70,800,804	127,327,260	271,875,642	78,592,555	466,037			599,599,135
Avg. Pay	28,344	52,059	60,661	67,279	71,513	77,673			57,720
45 to 49	1,481	1,082	1,507	2,140	3,650	1,019	4		10,883
Total Pay	38,192,866	57,257,531	91,642,244	141,344,490	258,449,408	75,036,251	337,145		662,259,935
Avg. Pay	25,789	52,918	60,811	66,049	70,808	73,637	84,286		60,853
50 to 54	1,235	656	968	1,242	1,603	1,883	341	9	7,937
Total Pay	26,561,350	32,743,609	58,414,733	82,215,623	112,128,856	141,021,748	26,428,299	771,555	480,285,773
Avg. Pay	21,507	49,914	60,346	66,196	69,949	74,892	77,502	85,728	60,512
55 to 59	1,517	465	610	913	1,003	726	265	33	5,532
Total Pay	25,011,517	20,976,754	35,767,841	58,954,988	70,939,328	56,218,141	23,218,735	2,581,322	293,668,626
Avg. Pay	16,487	45,111	58,636	64,573	70,727	77,435	87,618	78,222	53,085
60 to 64	1,679	344	305	482	483	390	106	47	3,836
Total Pay	21,246,589	12,139,654	17,529,572	31,791,751	34,076,493	28,894,613	8,938,762	3,162,631	157,780,065
Avg. Pay	12,654	35,290	57,474	65,958	70,552	74,089	84,328	67,290	41,131
65 & over	2,137	525	189	194	199	147	76	62	3,529
Total Pay	18,319,211	10,686,323	8,081,622	12,048,328	13,626,663	11,374,461	5,370,666	5,164,995	84,672,269
Avg. Pay	8,572	20,355	42,760	62,105	68,476	77,377	70,667	83,306	23,993
Total	23,845	12,769	11,965	10,467	8,045	4,171	792	151	72,205
Total Pay	609,765,277	630,366,296	715,019,182	692,731,372	568,248,299	313,011,251	64,293,607	11,680,503	3,605,115,787
Avg. Pay	25,572	49,367	59,759	66,182	70,634	75,045	81,179	77,354	49,929

Average Age: 43.5

Average Service: 10.9

TABLE 2

SCHEDULE OF ACTIVE MEMBER VALUATION DATA

Valuation Date	Number	Annual Payroll	Annual Average Pay	% Increase in Average Pay
9/30/2018	72,205	$ 3,605,115,787	$ 49,929	0.01%
9/30/2017	72,130	3,563,584,342	49,405	0.35
9/30/2016	71,848	3,537,226,348	49,232	1.19
9/30/2015	72,246	3,515,113,127	48,655	2.45
9/30/2014	73,407	3,486,326,799	47,493	2.12
9/30/2013	74,831	3,480,066,406	46,506	1.51
9/30/2012	75,951	3,479,567,004	45,813	1.33
9/30/2011	76,349	3,451,756,287	45,210	3.97
9/30/2010	76,387	3,321,614,223	43,484	1.51
9/30/2009	75,937	3,253,076,600	42,839	1.43

TABLE 3

NUMBER OF RETIRED MEMBERS AND BENEFICIARIES AND THEIR BENEFITS BY AGE AS OF JUNE 30, 2018

Attained Age	Number of Members	Total Annual Payment	Average Annual Benefits
49 & Under	833	$ 10,962,632	$ 13,160
50 – 54	1,466	59,000,557	40,246
55 – 59	4,140	180,263,981	43,542
60 – 64	7,967	332,177,567	41,694
65 – 69	12,885	510,187,288	39,595
70 – 74	11,706	440,901,296	37,665
75 – 79	7,212	259,248,784	35,947
80 – 84	4,199	139,521,951	33,227
85 – 89	2,471	73,501,434	29,746
90 & Over	1,498	37,752,626	25,202
Total	54,377	$ 2,043,518,116	$ 37,581

Average Current Age:	69.8	Average Age at Retirement:	56.1

Schedule G – Tables of Employee Data

TABLE 4

SCHEDULE OF RETIRANTS, BENEFICIARIES AND SURVIVORS ADDED TO AND REMOVED FROM ROLLS

	ADDED TO ROLLS		REMOVED FROM ROLLS		ROLLS AT END OF YEAR			
Fiscal Year Ending June 30	Number	Annual Allowances (in millions)	Number	Annual Allowances (in millions)	Number	Annual Allowances (in millions)	Increase In Annual Allowances	Average Annual Allowance
2009	2,351	$96.2	1,040	$22.7	42,050	$1,280.3	6.1%	$30,447
2010	2,105	93.7	1,021	21.8	43,134	1,352.2	5.6%	31,348
2011	2,133	98.9	848	17.7	44,419	1,433.4	6.0%	32,270
2012	2,513	111.2	838	19.4	46,094	1,525.2	6.4%	33,089
2013	2,303	105.7	991	22.2	47,406	1,608.7	5.5%	33,934
2014	2,146	99.6	976	23.4	48,576	1,684.9	4.7%	34,685
2015	2,917	119.1	1,671	36.3	49,822	1,767.6	4.9%	35,479
2016	2,753	128.2	1,012	26.9	51,563	1,868.9	5.7%	36,244
2017	2,638	119.8	1,235	35.2	52,966	1,953.5	4.5%	36,881
2018	2,499	120.0	1,088	30.0	54,377	2,043.5	4.6%	37,581