TEACHERS' RETIREMENT SYSTEM
of the State of Kentucky

Regular Quarterly Meeting

TRS Board of Trustees

A G E N D A

June 21, 2021, 12:30 p.m. ET

- Board Called to Order
- Roll Call

1. Reports for Consent
   - 1.1. Consideration/Approval of Minutes
     - 1.1.1. Quarterly Meeting, Board of Trustees, March 15, 2021
     - 1.1.2. Special Meeting, Governance and Audit Committee, March 15, 2021
     - 1.1.3. Special Meeting, Governance and Audit Committee, June 11, 2021
   - 1.2. Applications for Retirement and Annuity
   - 1.3. Survivor Benefits
   - 1.4. Life Insurance Benefits
   - 1.5. Refunds
   - 1.6. Interim Financial Statements

2. Standard Annual Board Actions
   - 2.1. Report of Results of Trustee Election
   - 2.2. Election of 2021-2022 Board Chair and Vice Chair
   - 2.3. 2021-2022 Committee Appointments
   - 2.4. Board Appointment of Investment Committee
   - 2.5. Resolution Regarding Purchases or Sales of Investment Instruments
   - 2.6. Transfer of Interest
   - 2.7. Transfer of Reserve Funds
   - 2.8. 2021-2022 Administrative Expense Fund Budget
   - 2.9. Internal Revenue Code Section 415(b) Limit
   - 2.10. Personnel Matters

3. Report of the Investment Committee

4. Report of the Governance and Audit Committee

5. Actuary's Report on the Experience Study

6. Executive Secretary's Observations and Comments

- General Discussion
- Adjournment

The meeting will be conducted by live video teleconference.
Information on accessing the meeting will be provided on TRS's website at:
https://trs.ky.gov/administration

TO: Board of Trustees of the Teachers' Retirement System of the State of Kentucky

FROM: Gary L. Harbin, CPA
Executive Secretary

DATE: June 21, 2021

SUBJECT: Reports for Consent

1.1. Consideration/Approval of Minutes

1.1.1. Regular Quarterly Meeting of the Board of Trustees, March 15, 2021
1.1.2. Governance and Audit Committee Special Meeting, March 15, 2021
1.1.3. Governance and Audit Committee Special Meeting, June 11, 2021

Recommendation: The executive secretary recommends approval of the minutes as presented.

1.2. Applications for Retirement and Annuity

The list of members who retired in March, April and May 2021 is included in the board materials. Initial retirements for the period included 142 retirees with monthly payments totaling $373,179.39. During the same period last year, 137 retirements resulted in monthly payments totaling $282,172.49. A summary of the payments and a comparison to last year follows.

Recommendation: The executive secretary recommends the board approve the initial payments listed in the report.

1.3. Survivor Benefits

The list of persons qualifying for survivor benefit payments for the quarter January 1 through March 31, 2021, is included in the board materials. During the period, 10 survivor benefits resulted in a total monthly payment of $5,627.66.

Recommendation: The executive secretary recommends the board approve the survivor benefit payments as listed in the report.

1.4. Life Insurance Benefits

The list of payments of life insurance benefits due to death of active and retired teachers for the period January 1 through March 31, 2021, is included in the board materials. Thirteen payments to the estates or beneficiaries of active teachers and 418 payments to the estates or beneficiaries of retired teachers resulted in total payments of $2,116,000. During the same quarter in 2020, 324 payments were made totaling $1,596,000.

Recommendation: The executive secretary recommends the board approve the life insurance benefit payments as listed in the report.

1.5. Refunds

The report of refunds for the quarter ended March 31, 2021, is attached. For the quarter, 649 refunds totaled $6,204,751.59. The refunds are for the following categories:

Regular withdrawals	609	$5,335,786.77
Deaths	40	$ 868,964.82
Totals	649	$6,204,751.59

During the same quarter in 2020, 546 refunds totaled $6,464,559.66.

Recommendation: The board is requested to approve the payment of refunds as listed in the report.

1.6. Interim Financial Statements

Attached are the Interim Financial Statements for the quarter ended March 31, 2021.

Recommendation: The Interim Financial Statements are provided for informational purposes and require no action by the board.

Teachers' Retirement System of Kentucky
Initial Applications for Retirement and Annuity
2021

	March	April	May	Total	Same Period 2020
Handicapped Child	*0* $0.00	*0* $0.00	*0* $0.00	*0* **$0.00**	*0* **$0.00**
Disability Retirement	*5* $19,034.39	*6* $21,283.18	*6* $15,126.61	*17* **$55,444.18**	*18* **$47,248.66**
Service Retirement	*52* $150,358.67	*32* $70,723.37	*38* $92,519.43	*122* **$313,601.47**	*118* **$232,205.51**
Beneficiary of Member Eligible to Retire	*1* $348.59	*0* $0.00	*2* $3,785.15	*3* **$4,133.74**	*1* **$2,718.32**
TOTALS	*58* **$169,741.65**	*38* **$92,006.55**	*46* **$111,431.19**	*142* **$373,179.39**	*137* **$282,172.49**

Reports for Consent
Member Account Refunds
For the period January 2021 - March 2021

Active Refunds	Count	Net Refund	Taxes Withheld	Rollovers	Total
January	253	753,811.39	188,452.94	1,222,511.95	2,164,776.28
February	189	656,862.79	163,833.17	699,472.41	1,520,168.37
March	167	636,342.19	158,932.35	855,567.58	1,650,842.12
Total	609				5,335,786.77

Deceased Refunds	Count	Net Refund	Taxes Withheld	Rollovers	Total
January	13	99,337.92	11,296.31	169,892.28	280,526.51
February	11	92,460.23	1,946.77	113,723.03	208,130.03
March	16	322,065.62	49,366.61	8,876.05	380,308.28
Total	40				868,964.82

Total Refunds	Count	Net Refund	Taxes Withheld	Rollovers	Total
January	266	853,149.31	199,749.25	1,392,404.23	2,445,302.79
February	200	749,323.02	165,779.94	813,195.44	1,728,298.40
March	183	958,407.81	208,298.96	864,443.63	2,031,150.40
Total	649				6,204,751.59

TEACHERS' RETIREMENT SYSTEM

OF THE STATE OF KENTUCKY

INTERIM FINANCIAL STATEMENTS

QUARTER ENDED MARCH 31, 2021

(FAIR VALUE - UNAUDITED)

Statements of Changes in Plan Net Assets
For the Nine Months Ended March 31, 2021 and 2020
(Fair Value - Unaudited)

	Retirement Annuity Trust		Health Insurance Trust		Life Insurance Trust		Other Funds		TOTAL	
	FY 2021	FY 2020	FY 2021	FY 2020	FY 2021	FY 2020	FY 2021	FY 2020	FY 2021	FY 2020
ADDITIONS										
Contributions										
Employer- State Paid	$ 785,216,504	$ 773,289,401	$ 63,057,078	$ 86,588,082	$ 1,277,493	$ 1,070,426	$ -	$ -	$ 849,551,075	$ 860,947,909
Employer- LSD, Other	54,043,618	54,487,779	78,987,979	78,089,127	231,123	192,541	365,866	-	133,628,586	132,769,447
Member- Active	239,055,692	234,342,716	97,505,031	96,264,481					336,560,723	330,607,197
Member- Retired			45,415,655	44,430,388					45,415,655	44,430,388
Recovery Income			83,969,152	71,888,081					83,969,152	71,888,081
Total Contribution	1,078,315,814	1,062,119,896	368,934,895	377,260,159	1,508,616	1,262,967	365,866	-	1,449,125,191	1,440,643,022
Investment Income/(Loss)										
Net Appreciation/(Depreciation) in Fair Value of Investments	4,460,568,275	(1,789,442,792)	367,445,371	(140,520,405)	17,524,325	(7,091,004)	51,678	5,835	4,845,589,649	(1,937,048,366)
Interest	71,021,648	119,172,664	2,038,385	6,788,084	369,471	646,806	4,883	11,090	73,434,387	126,618,644
Dividends	157,104,112	184,358,021	6,959,455	5,255,894	490,082	516,227	4,782	5,061	164,558,431	190,135,203
Rental Income, Net	15,248,975	20,454,209							15,248,975	20,454,209
Securities Lending, Net	1,932,580	1,591,994			40,285	13,800	523	213	1,973,388	1,606,007
Gross Investment Income	4,705,875,590	(1,463,865,904)	376,443,211	(128,476,427)	18,424,163	(5,914,171)	61,866	22,199	5,100,804,830	(1,598,234,303)
Less Investment Expense	(50,970,767)	(45,258,801)	(4,697,330)	(3,819,149)	(115,401)	(65,702)	-	-	(55,783,498)	(49,143,652)
Net Investment Income	4,654,904,823	(1,509,124,705)	371,745,881	(132,295,576)	18,308,762	(5,979,873)	61,866	22,199	5,045,021,332	(1,647,377,955)
Total Additions	5,733,220,637	(447,004,809)	740,680,776	244,964,583	19,817,378	(4,716,906)	427,732	22,199	6,494,146,523	(206,734,933)
DEDUCTIONS										
Benefits	1,676,869,647	1,625,670,278			4,771,289	4,070,000	129,416	185,133	1,681,770,352	1,629,925,411
Refunds of Contributions	20,457,168	24,703,675							20,457,168	24,703,675
Under 65 Insurance Expenses			77,333,171	80,838,083					77,333,171	80,838,083
Over 65 Insurance Expenses			154,066,914	147,206,966					154,066,914	147,206,966
Administrative Expense	10,367,155	10,311,255	-	-	-	-	-	-	10,367,155	10,311,255
Total Deductions	1,707,693,970	1,660,685,208	231,400,085	228,045,049	4,771,289	4,070,000	129,416	185,133	1,943,994,760	1,892,985,390
Net Increase (Decrease)	4,025,526,667	(2,107,690,017)	509,280,691	16,919,534	15,046,089	(8,786,906)	298,316	(162,934)	4,550,151,763	(2,099,720,323)
NET ASSETS HELD IN TRUST FOR PENSION BENEFITS										
Beginning of year	20,717,000,324	20,371,909,905	1,616,675,260	1,414,020,056	87,367,891	85,758,279	1,052,388	1,200,028	22,422,095,863	21,872,888,268
Ending of period	$ 24,742,526,991	$ 18,264,219,888	$ 2,125,955,951	$ 1,430,939,590	$ 102,413,980	$ 76,971,373	$ 1,350,704	$ 1,037,094	$ 26,972,247,626	$ 19,773,167,945

Statements of Plan Net Assets
as of March 31, 2021 and 2020
(Fair Value - Unaudited)

	Retirement Annuity Trust		Health Insurance Trust		Life Insurance Trust		Other Funds		TOTAL	
	FY 2021	FY 2020	FY 2021	FY 2020	FY 2021	FY 2020	FY 2021	FY 2020	FY 2021	FY 2020
ASSETS										
Cash	$ 181,301,603	$ 120,354,919	$ 60,424,303	$ 40,779,186	$ 334,152	$ 256,745	$ 289,884	$ 74,506	$ 242,349,942	$ 161,465,356
Receivables										
Contributions	53,939,286	38,277,522	25,205,437	22,738,889	13,058	19,353			79,157,781	61,035,764
State of Kentucky	-	-	-	826,203	87,931	120,308			87,931	946,511
Investment Income	42,747,821	51,446,307	2,942,288	2,420,395	273,122	325,174	2,682	3,345	45,965,913	54,195,221
Investment Sales Receivable	21,063,398	155,067,476	2,564,368	5,801,049	-	36,323			23,627,766	160,904,848
Installment Account Receivable	57,482	121,620							57,482	121,620
Other Receivables	-	26,255	31,412,112	27,664,213					31,412,112	27,690,468
Due from Other Funds	2,084,771	-							2,084,771	-
Total Receivables	119,892,758	244,939,180	62,124,205	59,450,749	374,111	501,158	2,682	3,345	182,393,756	304,894,432
Investments at Market Value										
Short Term Investments	1,203,436,899	490,344,549	128,609,992	24,423,317	11,045,789	7,619,666	343,849	350,199	1,343,436,529	522,737,731
Bonds and Mortgages	3,560,099,124	2,764,126,095	149,353,929	118,472,676	19,807,019	13,894,187	267,968	316,758	3,729,528,040	2,896,809,716
Stocks	15,090,151,029	10,561,734,719	1,181,082,960	749,505,956	63,412,821	49,832,855	447,875	292,286	16,335,094,685	11,361,365,816
Alternative Investments	1,565,129,041	1,572,914,884	145,585,547	122,926,274	685,305	425,831			1,711,399,893	1,696,266,989
Real Estate	1,353,236,374	1,233,109,511	103,821,974	83,353,436	4,443,825	2,375,546			1,461,502,173	1,318,838,493
Additional Categories	1,760,046,374	1,450,724,798	337,955,273	246,957,707	2,378,170	2,142,992			2,100,379,817	1,699,825,497
Total Investments	24,532,098,841	18,072,954,556	2,046,409,675	1,345,639,366	101,772,929	76,291,077	1,059,692	959,243	26,681,341,137	19,495,844,242
Capital Assets (net of accumulated depreciation)	12,072,094	14,087,302							12,072,094	14,087,302
Total Assets	24,845,365,296	18,452,335,957	2,168,958,183	1,445,869,301	102,481,192	77,048,980	1,352,258	1,037,094	27,118,156,929	19,976,291,332
LIABILITIES										
Liabilities										
Accrued Expenses and Other Liabilities	5,517,504	3,825,035	9,039,424	5,920,066					14,556,928	9,745,101
State of Kentucky			15,382,569						15,382,569	-
Contributions Not Posted	18,245,280	16,422,429	291,343	-					18,536,623	16,422,429
Investment Purchases Payable	62,653,272	153,140,568	13,381,861	7,705,115	3,547	57,953	-	-	76,038,680	160,903,636
Investment Fees Payable	16,422,249	14,728,037	2,859,798	1,304,530	27,685	19,654	-	-	19,309,732	16,052,221
Due to Other Funds	-	-	2,047,237	-	35,980	-	1,554	-	2,084,771	-
Total Liabilities	102,838,305	188,116,069	43,002,232	14,929,711	67,212	77,607	1,554	-	145,909,303	203,123,387
NET ASSETS HELD IN TRUST FOR PENSION BENEFITS	$ 24,742,526,991	$ 18,264,219,888	$ 2,125,955,951	$ 1,430,939,590	$ 102,413,980	$ 76,971,373	$ 1,350,704	$ 1,037,094	$ 26,972,247,626	$ 19,773,167,945

TO: Board of Trustees of the Teachers' Retirement System of the State of Kentucky

FROM: Gary L. Harbin, CPA
Executive Secretary

DATE: June 21, 2021

SUBJECT: Report of Results of Trustee Election

In accordance with KRS 161.260, the results of the elections of one active teacher trustee and the retired teacher trustee, as certified by the Department of Education, will be announced at the board meeting.

TO: Board of Trustees of the Teachers' Retirement System of the State of Kentucky

FROM: Gary L. Harbin, CPA
Executive Secretary

DATE: June 21, 2021

SUBJECT: Election of 2021-2022 Board Chair and Vice Chair

KRS 161.340 provides that the Board of Trustees annually shall elect from its membership a chair and a vice chair. Additionally, 102 KAR 2:010, Section 1 provides that the election will be conducted for the succeeding fiscal year at the last meeting of the current fiscal year (the June meeting).

A trustee is limited, under the amendments in House Bill 300 (2012 RS), to no more than four consecutive years serving as chair or vice chair.

Recommendation: The executive secretary recommends that the board elect a chair and vice chair consistent with KRS 161.340 and 102 KAR 2:010.

TO: Board of Trustees of the Teachers' Retirement System of the State of Kentucky

FROM: Gary L. Harbin, CPA
Executive Secretary

DATE: June 21, 2021

SUBJECT: 2021-2022 Committee Appointments

The chair of the board identifies standing committees that are to report and make recommendations to the full board. The chair also appoints members of the board to the committees for terms that correspond to the term of the chair. The chair will make committee appointments for the coming year and will notify those appointed. If you have any particular interest in serving on a committee, please notify the chair. The current committees and their members are as follows:

Administrative Appeals
Lynn Patterson, Chair
Hollis Gritton, Vice Chair
Laura Schneider
John Boardman, Alternate

Governance & Audit
Hollis Gritton, Chair
William Alverson, Vice Chair
Frank Collecchia
Lynn Patterson, Alternate

Insurance
Brenda McGown, Chair
Josh Underwood, Vice Chair
John Boardman
Laura Schneider, Alternate

Investment
Hollis Gritton, Chair
Brenda McGown, Vice Chair
William Alverson
John Boardman
Frank Collecchia
Josh Underwood
Alison Wright
Lynn Patterson, Alternate
Laura Schneider, Alternate

Legislative
Brenda McGown, Chair
Alison Wright, Vice Chair
Josh Underwood
Hollis Gritton, Alternate

Nominating
Laura Schneider, Chair
Alison Wright, Vice Chair
Hollis Gritton
William Alverson, Alternate

Personnel
Alison Wright, Chair
Brenda McGown, Vice Chair
William Alverson
Hollis Gritton
Lynn Patterson
Frank Collecchia, Alternate

Scholarship
Josh Underwood, Chair
Alison Wright, Vice Chair
William Alverson
Laura Schneider
Brenda McGown, Alternate

Benefits & Funding
Alison Wright, Chair
Allison Ball
Brenda McGown

TO: Board of Trustees of the Teachers' Retirement System of the State of Kentucky

FROM: Gary L. Harbin, CPA
Executive Secretary

DATE: June 21, 2021

SUBJECT: Board Appointment of Investment Committee

The Investment Committee is authorized under KRS 161.430, which provides that the board may appoint an investment committee to "… act for the board in all matters of investment, subject to approval of the board of trustees … ."

On December 15, 2008, the board adopted recommendations concerning the TRS investment program, which were promoted by a coalition of constituency groups and others. At the same time, the board delegated authority to the Investment Committee to implement these recommendations.

Later, Senate Bill 2 (2017 RS) provided for two trustees with investment experience appointed by the governor.

1. The chair at the meeting will review recommendations for seven trustees and two alternates to serve on the Investment Committee for fiscal year 2022 and ask the board to act on those.

Recommendation: The chair recommends for the Investment Committee for fiscal year 2022:

Hollis Gritton, Chair
William Alverson
John Boardman
Frank Collecchia
Alison Wright
Josh Underwood
Retired teacher trustee elected in 2021
Lynn Patterson, Alternate
Active teacher trustee elected in 2021, Alternate

2. Pursuant to the board's previously referenced recommendations, two nationally recognized, investment experts were appointed in 2009 to serve as non-voting members of the Investment Committee. Both investment experts have been appointed annually since then to continue on the Investment Committee.

Recommendation: The executive secretary recommends that the board ratify the appointment of Bevis Longstreth and George Philip to serve on the Investment Committee for fiscal year 2022.

TO: Board of Trustees of the Teachers' Retirement System of the State of Kentucky

FROM: Gary L. Harbin, CPA
Executive Secretary

DATE: June 21, 2021

SUBJECT: Resolution Regarding Purchases or Sales of Investment Instruments

The laws and regulations governing the administration of TRS authorize the board to delegate authority to the executive secretary and chief investment officer to execute purchases and sales of investment instruments on the board's behalf.

KRS 161.430 reads as follows:

> No investment or disbursement of funds shall be made unless authorized by the board of trustees, except that the board, in order to ensure timely market transactions, shall establish investment guidelines, by administrative regulation, and may permit its staff … to execute purchases and sales of investment instruments within those guidelines without prior board approval.

102 KAR 1:175, Section 1. (1)(c) reads as follows:

> To ensure a timely market transaction, the executive secretary and the chief investment officer may make a purchase or sale of an investment instrument without prior board approval if the action conforms to the provisions established in this administrative regulation.

The statute and regulation cover the retirement annuity and life insurance trusts, and, in accordance with KRS 161.677(3), the Health Insurance Trust is to be managed in the same general manner. Occasionally, TRS staff members must present proof that they are authorized to execute purchases and sales of investment instruments on the board's behalf. Historically, the board adopts a resolution annually for this purpose, which is copied into the board minutes. Staff presents a copy of the resolution to interested parties, when necessary, to execute purchases or sales of investment instruments on the board's behalf.

Recommendation: The executive secretary recommends that the board adopt the following resolution to confirm the authority granted to the executive secretary and the chief investment officer to execute purchases or sales of investment instruments on the board's behalf.

> BE IT RESOLVED, by the Board of Trustees of the Teachers' Retirement System of the State of Kentucky, that the executive secretary or chief investment officer be, and they hereby are, authorized and empowered to execute purchases or sales of all investment instruments in the name of, or belonging to, the Teachers' Retirement System of the State of Kentucky, or in its nominee name "KENTRES," in any capacity and includes all investment instruments of the retirement system provided for in KRS 161.220 to 161.716 and KRS 161.990, whether designated retirement annuity, life insurance, health insurance trust or the Kentucky Teachers' Retirement System insurance trust.

TO: Board of Trustees of the Teachers' Retirement System of the State of Kentucky

FROM: Gary L. Harbin, CPA
Executive Secretary

DATE: June 21, 2021

SUBJECT: Transfer of Interest

KRS 161.440 requires that a transfer of interest be made from the Guarantee Fund to other funds, except the Expense Fund and Health Insurance Trust. The executive secretary requests authority from the board to make the required transfer of funds as of July 1, 2021.

Recommendation: The executive secretary recommends that the board issue a directive as follows:

> In accordance with KRS 161.440, the executive secretary is authorized and directed to credit the required interest on average monthly balances to (1) the Teachers' Savings Fund, (2) the State Accumulation Fund and (3) the Allowance Reserve Fund, with such credits to be transferred from the Guarantee Fund and credited on July 1, 2021.

TO: Board of Trustees of the Teachers' Retirement System of the State of Kentucky

FROM: Gary L. Harbin, CPA
Executive Secretary

DATE: June 21, 2021

SUBJECT: Transfer of Reserve Funds

KRS 161.420 requires TRS each year to transfer an amount equal to the accounts of members retiring on July 1, along with an equal amount from the State Accumulation Fund, to the Allowance Reserve Fund. In addition, sufficient sums must be transferred during the year at the time of retirement of individual teachers.

Recommendation: The executive secretary recommends that the board issue a directive authorizing the transfer of reserve funds and requests that the authorization cover the transfer of accounts of teachers who will retire during the 2022 fiscal year as follows:

> The executive secretary is directed to determine the aggregate amount of the accumulated accounts of teachers retiring during fiscal year 2022 and to transfer from the Teachers' Savings Fund to the Allowance Reserve Fund a sum equal to that amount; and, further, to transfer a matching amount from the State Accumulation fund to the Allowance Reserve Fund, both of which transfers are authorized by KRS 161.420(2) and (3).

TO: Board of Trustees of the Teachers' Retirement System of the State of Kentucky

FROM: Gary L. Harbin, CPA
Executive Secretary

DATE: June 21, 2021

SUBJECT: 2021-2022 Administrative Expense Fund Budget

Administrative Expense Fund Budget: The state budget adopted by the legislature sets amounts that the retirement system may expend for administration during a fiscal year. The allowable budget of $16,320,600 was approved by the legislature for the 2022 fiscal year. The amount approved was $49,000 less than the proposed budget recommended by the board.

A copy of the proposed 2021-2022 administrative budget is attached. Also attached are additional materials comparing TRS's administrative expenses with those of other retirement systems and a schedule of actual administrative expenses during the current fiscal year through April 30, 2021.

Recommendation: The executive secretary recommends that the board approve the proposed 2021-2022 Administrative Expense Fund Budget as presented.

Teachers' Retirement System of the State of Kentucky
Administrative Budget

	Final Budget 2020-2021	Proposed Budget 2021-2022
PERSONNEL COSTS		
Salaries & Wages	$ 7,875,100	$ 7,875,100
FICA/Medicare	248,700	248,700
Retirement	2,264,100	2,264,100
Health/Life Insurance	877,800	877,800
SUB TOTAL PERSONNEL	11,265,700	11,265,700
Worker's Compensation	5,900	5,900
Unemployment Compensation	4,600	4,600
Employee Training	59,500	59,500
Legal Services	127,300	127,300
Auditing	122,800	122,800
Medical Review	100,100	100,100
Consulting Services	102,000	102,000
Actuarial	333,100	333,100
Investigative Services	40,700	40,700
Janitorial Services	40,200	40,200
Other	2,200	2,200
TOTAL PERSONNEL COSTS	12,204,100	12,204,100
OPERATING EXPENSES		
Natural Gas	19,700	19,700
Electricity	90,200	90,200
Water & Sewage	12,800	12,800
Meeting Room Rentals	9,300	9,300
Copy Machine Rental	18,000	18,000
Motorpool Rental	5,700	5,700
Maintenance-Building & Grounds	100,900	100,900
Equipment Maintenance	13,800	13,800
Computer Maintenance	220,600	220,600
Postage & Delivery Services	474,900	474,900
Printing	198,900	198,900
Insurance	209,500	209,500
Other	10,500	10,500
Telephone	28,200	28,200
Computer Services	133,000	133,000
Office Supplies	63,900	63,900
Furniture under $5000	14,100	14,100
Computer Software	1,790,500	2,010,800

Teachers' Retirement System of the State of Kentucky
Administrative Budget

Storage	6,900	6,900
Travel-In State	28,600	28,600
Travel-Out-of-State	30,000	30,000
Subscriptions & Dues	177,000	177,000
Other	10,100	10,100
Computers (PC) Under $5,000	103,200	103,200
TOTAL OPERATING EXPENSES	3,770,300	3,990,600
CAPITAL OUTLAY		
Furniture/Office Equipment	34,900	34,900
Computers over $5,000	91,000	91,000
TOTAL CAPITAL OUTLAY	125,900	125,900
TOTAL EXPENDITURES	$ 16,100,300	$ 16,320,600

TEACHERS RETIREMENT SYSTEM KENTUCKY
ADMINISTRATIVE EXPENSES ANALYSIS

Our actual expenses vs. Budget	Actuarial Liabilities End of Year	Actual Expenses	Basis Points	Budgeted Expenses	Percent Expended	Amount returned to Pension Fund at year end
Through Current Year 4/30/21		***11,512,765***		***13,416,918***	***85.81%***	
Fiscal Year 6/30/20	38,462,097,000	14,251,423	0.0371%	15,439,000	92.31%	905,376.25
Fiscal Year 6/30/19	37,927,400,000	13,711,337	0.0362%	13,949,200	98.29%	168,176.39
Fiscal Year 6/30/18	37,325,775,194	13,168,116	0.0353%	13,515,000	97.43%	86,312.25
Fiscal Year 6/30/17	36,696,529,800	11,881,187	0.0324%	12,934,000	91.86%	799,722.32
Fiscal Year 6/30/16	35,768,359,000	10,960,754	0.0306%	12,196,600	89.87%	785,982.95
Fiscal Year 6/30/15	34,774,285,000	10,440,118	0.0300%	12,196,600	85.60%	2,020,284.36
Fiscal Year 6/30/14	33,476,447,000	9,078,009	0.0271%	12,030,300	75.46%	3,814,011.56
Fiscal Year 6/30/13	32,432,630,000	9,677,241	0.0298%	12,030,300	80.44%	5,179,859.68
Fiscal Year 6/30/12	30,659,792,000	8,987,875	0.0293%	12,030,300	74.71%	3,208,685.47
Fiscal Year 6/30/11	29,479,929,000	8,530,724	0.0289%	11,428,700	74.64%	3,104,778.23
Fiscal Year 6/30/10	27,643,213,000	8,830,054	0.0319%	10,851,000	81.38%	2,187,712.93
Fiscal Year 6/30/09	29,945,493,000	8,165,757	0.0273%	10,102,600	80.83%	2,118,883.81
Fiscal Year 6/30/08	28,979,091,000	7,551,936	0.0261%	9,453,500	79.89%	2,044,217.34
Fiscal Year 6/30/07	27,266,457,000	7,351,846	0.0270%	9,075,400	81.01%	1,877,948.70
Fiscal Year 6/30/06	24,666,744,000	6,839,859	0.0277%	8,613,500	79.41%	1,902,090.55
Fiscal Year 6/30/05	23,898,817,000	6,652,673	0.0278%	8,147,900	81.65%	1,751,527.21

Our expenses compared to similar size systems	Actuarial Liabilities End of Year	Actual Expenses	Basis Points
Kentucky Retirement System 6/30/20	47,130,019,000	37,668,000	0.0799%
New Mexico Public Employees 6/30/20	22,700,703,052	14,318,348	0.0631%
Indiana Public Employees 6/30/20	16,281,754,000	18,887,000	0.1160%
Georgia Employees 6/30/20	19,220,429,000	16,666,000	0.0867%
Kansas Public Employees 6/30/20	29,982,336,611	13,607,382	0.0454%
Louisiana Teachers 6/30/20	32,341,000,000	14,418,014	0.0446%
Kentucky Teachers 6/30/20	***38,462,097,000***	***14,251,423***	***0.0371%***
Ohio Teachers Retirement System 6/30/20	101,949,186,000	68,019,000	0.0667%

ACTUAL SPENDING V. BUDGET
FOR THE TEN MONTHS ENDING APRIL 30, 2021

	ACTUAL Y T D	BUDGET Y T D	VARIANCE
Regular Salaries & Wages	$ 6,130,954.54	$ 6,562,583.30	431,628.76
Employers FICA	148,660.53	207,250.00	58,589.47
Employers Retirement Credit	1,600,136.57	1,886,750.00	286,613.43
Employer Health Insurance	699,095.29	728,501.30	29,406.01
Employer Life Insurance	995.00	3,000.00	2,005.00
Worker's Compensation	7,237.74	4,916.60	(2,321.14)
Unemployment Compensation	-	3,833.30	3,833.30
Employee Training	11,301.75	49,583.30	38,281.55
Employee Uniforms	-	833.30	833.30
Legal Services	54,392.39	106,084.00	51,691.61
Auditing Service	103,746.00	102,333.30	(1,412.70)
Medical & Dental Services	66,950.00	83,418.00	16,468.00
Consulting Services	85,000.00	85,000.00	-
Misc. Services	30,112.99	33,916.60	3,803.61
Court Reporting	-	1,000.00	1,000.00
Actuarial Services	183,941.75	277,584.00	93,642.25
Janitorial Services	33,250.00	33,500.00	250.00
Natural Gas	10,399.71	16,416.70	6,016.99
Electricity	59,447.03	75,166.60	15,719.57
Water & Sewage	-	10,666.60	10,666.60
Rent of Non-St Owned Build/Land	-	3,500.00	3,500.00
Rent of State Owned Build/Land	-	3,833.30	3,833.30
Rent of Equipment	-	416.70	416.70
Copy Machine Rental	11,747.09	14,999.90	3,252.81
State Carpool Rental	-	4,750.00	4,750.00
Maintenance-Buildings & Grounds	28,996.02	84,084.70	55,088.68
Maintenance of Equipment	1,613.50	6,166.60	4,553.10
Computer Maintenance	1,422.71	183,832.00	182,409.29
Postage & Postage Meters	399,630.25	390,333.30	(9,296.95)
Other Parcel Delivery Services	580.25	5,416.70	4,836.45
Printing Pd to State Agency	-	2,916.70	2,916.70
Printing Pd to Vendor	96,762.54	162,833.30	66,070.76
Insurance Premium	192,526.11	174,583.30	(17,942.81)
Garbage Collection	1,236.87	2,500.00	1,263.13
Service Not Otherwise Classified	4,131.74	6,250.00	2,118.26
Telephone Paid to Vendor	17,713.39	23,500.00	5,786.61
Dept Tech Serv Computer Charges	44,872.49	110,833.30	65,960.81
Comp Modem-Line Chg	-	3,333.30	3,333.30
Computer Equip Under $5000	10,787.00	65,583.30	54,796.30
MARS Charges	20,700.00	17,083.30	(3,616.70)
Office Supplies	17,727.21	52,083.30	34,356.09
Motor Vehicle Supplies & Parts	135.50	1,000.00	864.50
Building Material & Supplies	523.52	2,583.30	2,059.78
Motor Fuel & Lube	571.18	1,750.00	1,178.82
Furn/Fixtures/Equip Under $5000	4,176.99	11,750.00	7,573.01
Books for Dept Use	498.66	1,166.70	668.04
Computer Software	1,325,872.62	1,492,082.70	166,210.08
Banking Service & Fees	-	-	-
Storage	5,864.64	5,750.00	(114.64)
In-State Travel	90.58	19,666.60	19,576.02
Out-of-State Travel	604.59	25,000.00	24,395.41
Travel Non-State Employees	-	4,166.60	4,166.60
Dues & Subscriptions	102,881.69	147,498.70	44,617.01
Other	(4,523.14)	8,416.70	12,939.84
Furniture/Fixture/Equip Over $5000	-	29,083.30	29,083.30
Telephone/Telecom Equipment	-	-	-
Computer Equip Over $5000	-	75,833.30	75,833.30
	$ 11,512,765.29	$ 13,416,917.80	$ 1,904,152.51

TO: Board of Trustees of the Teachers' Retirement System of the State of Kentucky

FROM: Gary L. Harbin, CPA
Executive Secretary

DATE: June 21, 2021

SUBJECT: Internal Revenue Code Section 415(b) Limit

KRS 161.611 authorizes a supplemental retirement benefit plan for the sole purpose of enabling TRS to apply the same formula for determining benefits payable to all members whose benefits under the retirement system are limited by Section 415 of the Internal Revenue Code. This plan requires annual transfers from employer contributions to fund the limited benefit.

Recommendation: The executive secretary requests authorization to make necessary transfers from employer contributions sufficient to provide the benefits authorized in KRS 161.611 for fiscal year 2022.

TO: Board of Trustees of the Teachers' Retirement System of the State of Kentucky

FROM: Gary L. Harbin, CPA
Executive Secretary

DATE: June 21, 2021

SUBJECT: Personnel Matters – Employee Annual Salary Increments

KRS 161.340(2) provides that the board shall employ all personnel required to transact the business of the retirement system. The law also provides that "… the power over and the control for determining and maintaining an adequate complement of employees in the system shall be under the exclusive jurisdiction of the Board of Trustees … ."

The personnel system established by the board for employees of the retirement plan is, in many respects, very different than the personnel system for other state employees. The board has established a different system because the board's duty is to attract and retain qualified employees to satisfy the retirement plan's statutory mission. The board's personnel system has helped TRS maintain high employee job satisfaction and very low levels of employee turnover. TRS also over time has departed from many of the standards established in the state's personnel system. For example, TRS uses a 40-hour work week (compared to the state's 37.5-hour work week) because the 40-hour week is a better fit for TRS's strategic objectives.

Although the TRS personnel system is separate and distinct from the state system, the board remains mindful of the state system. The TRS Employee Compensation Plan provides that all employees eligible for annual salary increments shall receive increments equal to the percent funding available for state employees that is provided in the budget approved by the General Assembly. The budget passed in the 2021 Regular Session of the General Assembly provides for no state employee annual increments.

The executive secretary requests authorization from the board to approve normal salary advancements that will maintain salary increments for TRS employees equal to that received by state employees, as provided by the TRS's Employee Compensation Plan, during fiscal year 2022.

All eligible TRS employees are included in this authorization except for the executive secretary. Personnel Committee members will conduct the performance evaluation of the executive secretary at a meeting to be scheduled by the chair of the Personnel Committee. The committee will report its recommendations to the board at a meeting following the evaluation. If the board chooses to provide an increment for the executive secretary, the board must determine the increase and authorize the chair to implement the increment.

Recommendation: The executive secretary recommends that the board approve normal salary advancements that will maintain salary increments for TRS employees equal to that received by state employees, as provided by TRS's Employee Compensation Plan, during fiscal year 2022.

TO: Board of Trustees of the Teachers' Retirement System of the State of Kentucky

FROM: Gary L. Harbin, CPA
Executive Secretary

DATE: June 21, 2021

SUBJECT: Report of the Investment Committee

1. Investment Committee Meeting and Actions: New investments presented at the May 20, 2021, Investment Committee meeting were a commitment to Apax Digital Fund II of up to $50 million from the Retirement Annuity Trust and up to $10 million from the Health Insurance Trust. TRS's managers contract renewals for fiscal year 2022 were approved for Baillie Gifford, Fort Washington, Galliard, State Street, Todd, UBS and Wellington. Additionally, contract changes for the TRS Credit Fund that is managed by Marathon were approved. Contract renewals of service providers Aon Investments USA, Ice Miller and Reinhart and Boerner Van Deuren were approved under the same terms. Outside manager State Street Asset Management presented on their portfolio.

2. Purchases and Disposals: The Report of the Investment Committee for the quarter ended March 31, 2021, is presented for review and approval. During this quarter, 2,467 purchases amounted to $6,431,211,322.83 and 3,754 disposals amounted to $5,844,702,921.70. Disposals consisted of 3,382 sales, 336 principal payments and 36 redemptions. While TRS investment staff initiate these transactions, the custodian of securities is responsible for handling and securing each stock, bond or other type of investment. At the end of the quarter, TRS's invested securities had a book value of $17,452,259,644.20 and a market value of $24,532,406,316.84.

3. Staff's Comments on Economic and Market Conditions: Vaccination rates in the United States outpaced much of the developed world, with 28% of Americans having received at least one dose of a vaccine by quarter-end compared to 11% in the Eurozone and less than 5% in much of Asia. COVID-19 cases and hospitalizations fell considerably from winter highs in the United States, as the economy tilted toward reopening. The federal government moved quickly to enact the $1.9 trillion American Rescue Plan. On the monetary policy side, the Federal Open Market Committee reiterated its commitment to average inflation targeting centered around 2% during its March meeting and announced its intent to maintain current asset purchases of at least $120 billion a month until substantial progress is made toward full employment. With the reopening in motion and prospects for fiscal stimulus well above the year-end consensus, interest rates on the 10-year Treasury bond rose from 0.93% to 1.74% during the quarter. The S&P 500 returned 6.2%, driven primarily by resurgent returns from value stocks, outperforming developed non-U.S. and emerging markets as dollar strength proved a headwind for foreign stocks. Within fixed income, the movement in rates proved challenging as most groups delivered negative returns in the quarter with higher-yielding, lower-quality issues faring best and producing moderately positive results. In March, the unemployment rate fell to 6% and non-farm payrolls increased by 916,000. The Institute for Supply Management Manufacturing and Services purchasing managers' indexes came in at 64.7% and 63.7%, respectively, the latter of which is a record.

U.S. equity markets opened calendar 2021 with solid performance in the quarter ended March 31, driven by the passage of the American Rescue Plan and hopes for a full reopening of the U.S. economy with an ahead-of-schedule vaccine rollout. After poor performance at the start of the quarter, the S&P 500 Index rebounded to finish up 6.2%. In the quarter, value continued to outperform growth across the market capitalization spectrum, while small-cap stocks also significantly outperformed their larger-cap counterparts. During the quarter, the Russell 1000 Value Index returned 11.2% versus 0.9% for the Russell 1000 Growth Index. Similarly, the Russell 2000 Value Index returned 21.2%, compared to 4.9% for the Russell 2000 Growth. The prospect of increased economic activity contributed to strong performance in the energy and financial sectors. Momentum across growth-oriented technology stocks continued to wane due to pressures from relatively elevated valuation levels and a higher discount rate on future cash flows caused by rising Treasury yields.

While developed international equities lagged the U.S. market in the quarter, the sector did provide positive absolute returns. The rotation into value stocks continued with growth stocks finishing in negative territory. Small-cap stocks also outperformed large-cap stocks. Energy and financials were the best performing sectors, while consumer staples and utilities trailed the general market. Unlike the United States, Europe has seen another rise in infections, and vaccine distribution has been slow. Many countries in Asia, developed and emerging, that initially contained the virus also have struggled on the vaccination front.

The Bloomberg U.S. Gov/Credit Index declined 4.28% in the quarter, while Treasury yields rose abruptly. Investors primarily drove the abrupt increase as they reacted to inflationary pressure from a strong economic recovery that was supported by expansive fiscal policy and pent-up consumer demand. The 10-year Treasury yield increased to 1.7% to finish, up from an initial 0.9%. The combination of low yields and rising rates created a challenging environment for fixed income. However, sub-investment grade-rated debt continued outperforming the broader market, a trend also seen in the quarter that ended December 31, 2020. The Bloomberg U.S. High Yield Index returned 0.9%, carried largely by the lowest quality debt, with Caa-rated debt returning 3.6%.

Core private real estate generated a 2.1% return in as reported by the NFI-ODCE Index, divided between 1% from income and 1.1% from price appreciation. While the income component improved over the prior quarter and is more in line with historical levels, price appreciation rebounded meaningfully by 0.7% from the level recorded in the quarter ended December 31, 2020.

4. Performance: Investment performance was strong for the quarter ended March 31, 2021. The Retirement Annuity Trust portfolio appreciated 3.44%, while the Policy Index increased 3.75%. TRS's domestic equities increased 7.73%, outgaining the S&P 1500 index, which increased 6.91%. TRS's international stocks returned 2.33%, underperforming the MSCI All Country ex-U.S. index, which had a return of 3.6%. Alternatives and additional categories made positive contributions as private equity gained 7.12% while additional categories returned 4.54%. TRS's fixed income declined 4.49%, underperforming the Bloomberg Barclays Gov/Credit Bond index which declined 4.28%. Real estate returned 1.95%.

Recommendation: The executive secretary recommends that the board accept and ratify the Report of the Investment Committee.

Teachers' Retirement System of the State of Kentucky
Retirement Annuity Trust
Quarterly Investment Performance
Gross Returns
For the Period Ended March 31, 2021

FINAL

	Market Value	Last Qtr	FYTD	1-Year	3-Year*	5-Year*	10-Year*	20-Year*
TOTAL PLAN	$ 24,532,406,316.84	3.44	23.05	40.86	11.81	12.30	9.86	7.39
Policy Benchmark		*3.75*	*21.51*	*37.67*	*11.30*	*11.63*	*9.40*	-
Total Equity	$ 15,199,959,226.98	5.85	35.62	68.53	15.03	15.99	12.20	8.03
Domestic Equity	$ 9,995,248,332.67	7.73	37.04	70.79	17.15	17.01	14.00	8.89
S&P 1500 Index		*6.91*	*31.43*	*58.73*	*16.47*	*16.15*	*13.74*	*8.49*
All-Cap Equities	$ 519,600,958.58	10.12	41.23	70.79	19.38	-	-	-
Russell 3000 Index		*6.35*	*33.19*	*62.53*	*17.12*	*16.64*	*13.79*	-
Large-Cap Equities	$ 8,080,654,912.56	7.20	35.26	68.89	17.37	17.09	14.11	-
S&P 500 Index		*6.17*	*29.71*	*56.35*	*16.78*	*16.29*	*13.91*	-
Mid-Cap Equities	$ 849,152,143.58	8.66	42.75	78.17	15.25	16.48	13.23	-
S&P 400 Index		*13.47*	*47.86*	*83.46*	*13.40*	*14.37*	*11.92*	-
Small-Cap Equities	$ 545,840,317.95	12.41	54.00	90.17	14.16	15.88	13.27	-
S&P 600 Index		*18.24*	*60.18*	*95.33*	*13.71*	*15.60*	*12.97*	-
International Equity	$ 5,204,710,894.31	2.33	32.86	64.10	11.23	14.09	7.88	-
MSCI AC World Ex US		*3.60*	*29.01*	*50.03*	*7.02*	*10.28*	*5.41*	-
Fixed Income	$ 3,862,680,341.52	-4.49	-2.83	1.19	5.21	3.71	4.21	5.21
Bloomberg Barclays Govt/Credit Index		*-4.28*	*-2.75*	*0.86*	*4.99*	*3.36*	*3.70*	*4.62*
Real Estate	$ 1,353,236,373.94	1.95	4.13	4.13	6.58	8.33	8.67	9.02
In House Real Estate Equity	$ 403,430,071.63	1.07	2.47	4.13	5.02	7.83	7.95	8.38
CPI plus 2%		*1.74*	*4.46*	*4.69*	*4.04*	*4.19*	*3.76*	*4.06*
Core Real Estate	$ 584,795,353.35	1.68	2.06	3.46	6.47	7.07	10.50	-
NCREIF ODCE (VW) Index		*2.09*	*3.92*	*2.30*	*4.88*	*6.19*	*9.67*	-
Non-Core Real Estate	$ 365,010,948.96	3.42	9.28	4.88	8.74	10.53	-	-
NCREIF Property Index		*1.72*	*3.64*	*2.61*	*4.89*	*5.81*	-	-
Private Equity	$ 1,356,384,068.92	7.12	23.82	14.54	12.69	13.56	12.90	-
Mature Private Equity	$ 665,046,468.69	6.88	21.87	11.31	10.19	10.18	-	-
S&P 500 Index plus 3%		*6.96*	*32.61*	*61.04*	*20.28*	*19.78*	-	-
Private Equity < 5 Years	$ 691,337,600.23	8.54	29.30	21.33	15.58	17.03	-	-
Timberland	$ 208,744,972.38	-11.41	-6.30	-5.32	0.89	0.48	2.75	-
NCREIF Timberland Index		*0.76*	*1.38*	*1.46*	*1.71*	*2.51*	*4.55*	-
Additional Categories	$ 1,795,401,629.21	2.55	12.53	15.28	5.88	6.83	5.81	-
B of A Merrill Lynch U.S. High Yield Master II Index		*0.90*	*12.50*	*23.31*	*6.53*	*7.94*	*6.31*	-
Cash (Unallocated)	$ 755,999,703.89	0.01	0.03	0.06	1.36	1.13	0.62	1.54
90 Day T-Bill		*0.02*	*0.09*	*0.12*	*1.49*	*1.18*	*0.62*	*1.36*

Total Trust Gross Return for 30-year period* **8.45**

*Returns are annualized for periods longer than one year

** Prior to July 1, 2008, TRS did not benchmark overall fund performance. Effective July 1, 2008, the Board of Trustees approved a Policy Index that represents the returns of appropriate benchmarks for the various asset classes weighted by the mid-point of the strategic range for the current fiscal year.

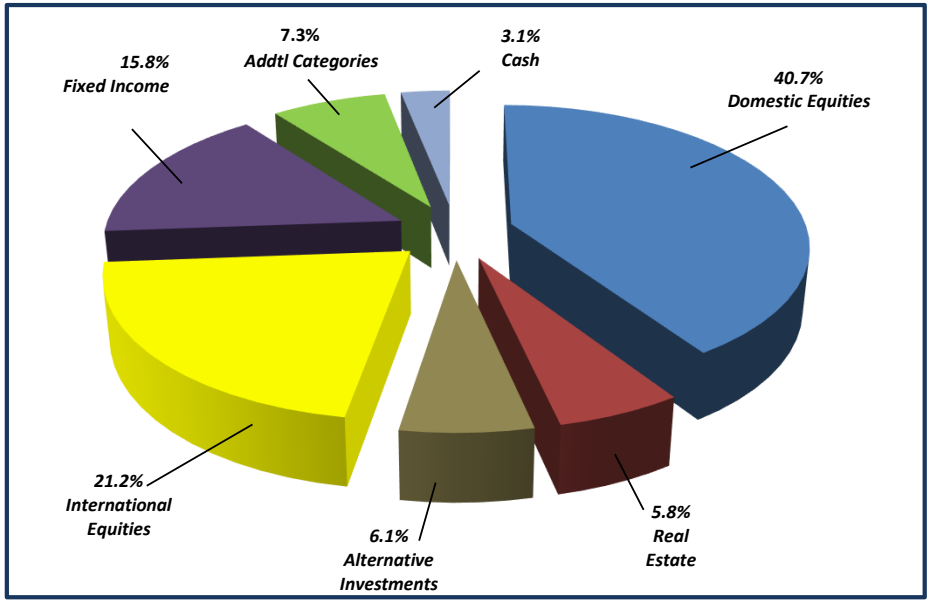
Teachers' Retirement System of Kentucky

Quarterly Investment Update

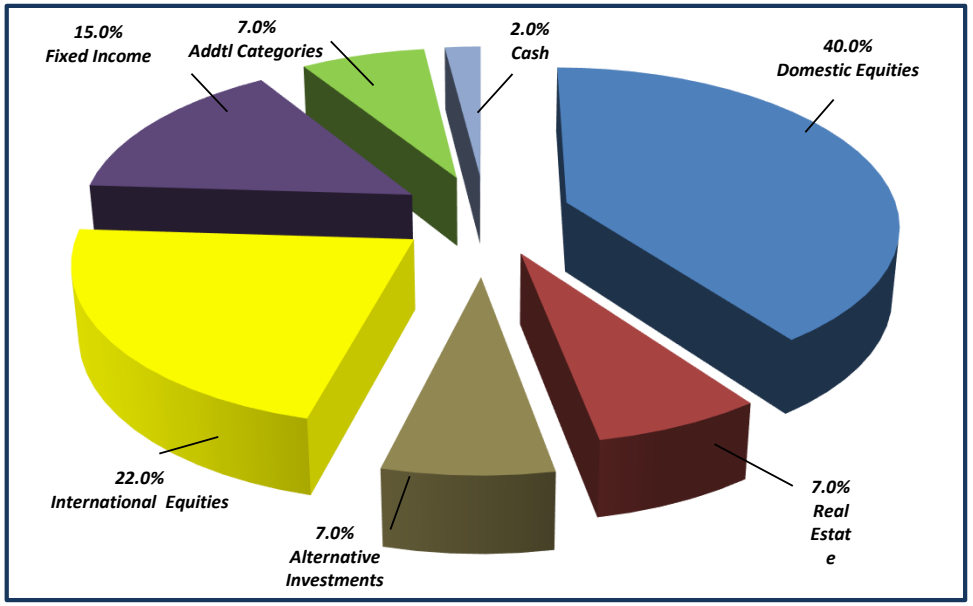
For the period ended March 31, 2021

($ in millions)	$'s	3/31/2021 Actual %	12/31/2020 Actual %	Target %	Strategic Ranges
Domestic Equities	$9,995.3	40.7%	40.6%	40.0%	34.0 - 48.0%
Real Estate	1,353.2	5.8%	5.3%	7.0%	4.0 - 10.0%
Alternative Inv.	1,565.1	6.1%	6.5%	7.0%	4.0 - 10.0%
International Equities	5,204.7	21.2%	22.7%	22.0%	18.0 - 25.0%
Fixed Income	3,862.7	15.8%	14.5%	15.0%	8.0 - 22.0%
Addtl Categories	1,795.4	7.3%	7.1%	7.0%	4.0 - 15.0%
Cash	756.0	3.1%	3.3%	2.0%	1.0 - 5.0%
Total	**$24,532.4**	**100.0%**	**100.0%**	**100.0%**	

ACTUAL %



TARGET %



Teachers' Retirement System of the State of Kentucky
Health Insurance Trust
Quarterly Investment Performance
Gross Returns
For the Period Ended March 31, 2021

FINAL

	Market Value	Last Qtr	FYTD	1-Year	3-Year*	5-Year*	10-Year*
TOTAL PLAN	$2,046,409,675.03	3.76	23.62	38.76	10.95	11.53	-
Policy Benchmark		*3.96*	*22.39*	*38.36*	*10.37*	*11.22*	-
Total Equity	$1,182,649,012.26	4.98	33.84	63.12	13.50		
All Cap Equities	$ 57,756,981.99	10.13	41.32	70.90	18.59	-	-
Russell 3000		*6.35*	*33.19*	*62.53*	*17.12*	-	-
Large Cap Equities	$ 95,035,600.72	-1.54	54.46	141.88	-	-	-
S&P 500 Index		*6.17*	*29.71*	*56.35*	-	-	-
Global Equities	$1,029,856,429.55	5.38	31.95	58.22	12.31	13.59	9.57
MSCI AC World IMI (Net)		*5.14*	*31.50*	*57.58*	*11.90*	*13.21*	*9.15*
Fixed Income	$ 188,143,547.72	-3.68	-2.27	1.79	5.22	3.28	2.28
Barclays Government Credit		*-4.28*	*-2.75*	*0.86*	*4.99*	*3.36*	*3.70*
Real Estate	$ 103,821,974.23	2.89	8.02	6.73	9.08	10.50	-
Core Real Estate	$ 50,364,126.96	2.10	4.09	5.00	7.50	7.54	-
NCREIF ODCE (VW)		*2.09*	*3.92*	*2.30*	*4.88*	*6.19*	-
Non-Core Real Estate	$ 53,457,847.27	3.67	11.30	8.12	10.41	11.92	-
NCREIF Property Index		*1.72*	*3.64*	*2.61*	*4.89*	5.81	-
Private Equity	$ 145,585,546.88	9.70	24.83	15.31	11.88	14.80	-
Mature Private Equity	$ 40,938,351.06	10.87	18.01	8.38	11.52	13.13	-
S&P 500 plus 3%		*6.96*	*32.61*	*61.04*	*20.28*	*19.78*	-
Private Equity < 5 Years	$ 104,647,195.82	11.81	31.56	21.76	13.39	15.88	-
Additional Categories	$ 357,665,125.67	1.96	13.08	16.27	5.96	7.34	5.83
B of A Merrill Lynch High Yield Master II		*0.90*	*12.50*	*23.31*	*6.53*	*7.94*	*6.31*
Cash (Unallocated)	$ 68,544,468.27	0.01	0.03	0.07	1.44	1.16	0.64
90 Day T-Bill		*0.02*	*0.09*	*0.12*	*1.49*	*1.18*	*0.62*

*Returns are annualized for periods longer than one year
** Prior to July 1, 2015, TRS did not benchmark overall fund performance. Effective July 1, 2015, the Board of Trustees approved a Policy Index that represents the returns of appropriate benchmarks for the various asset classes weighted by the mid point of the strategic range for the current fiscal year.

Teachers' Retirement System of Kentucky

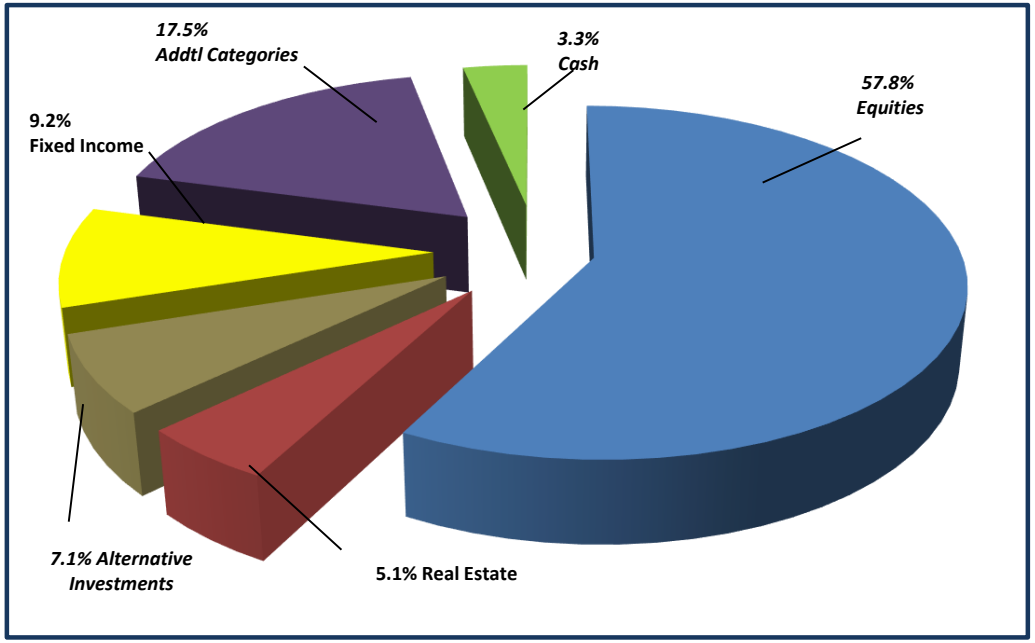
Insurance Trust Fund

Quarterly Investment Update

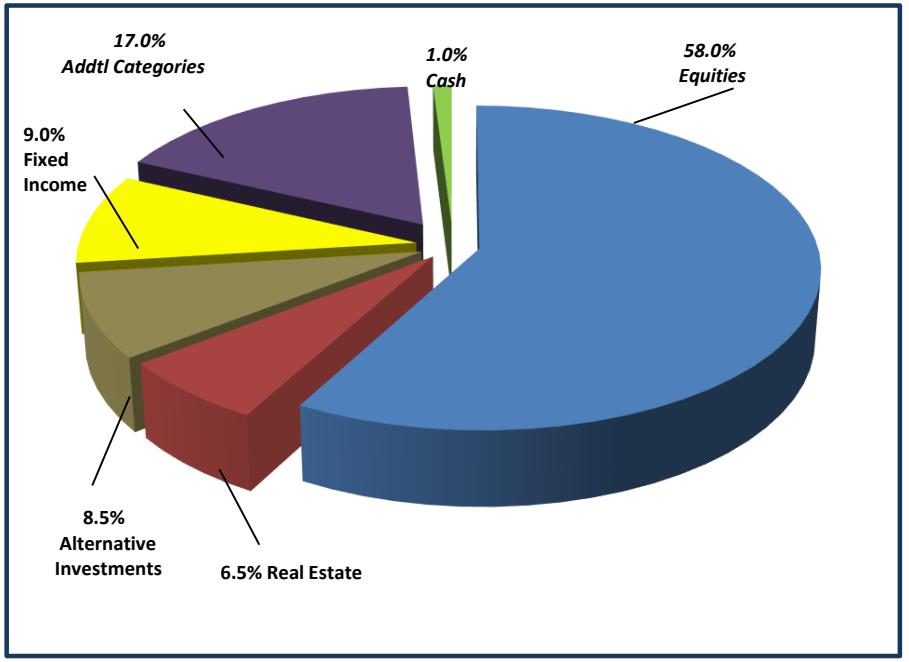
For the period ended March 31, 2021

($ in thousands)	$'s	3/31/2021 Actual %	12/31/2020 Actual %	Target %	Strategic Ranges
Equities	$1,182,649.0	57.8%	61.1%	58.0%	51.0 - 64.0%
Real Estate	$103,822.0	5.1%	4.7%	6.5%	4.0 - 12.0%
Alternative Inv.	$145,585.6	7.1%	7.3%	8.5%	5.0 - 12.0%
Fixed Income	$188,143.5	9.2%	7.0%	9.0%	6.0 - 12.0%
Addtl Categories	$357,665.1	17.5%	15.6%	17.0%	14.0 - 21.0%
Cash	$68,544.5	3.3%	4.3%	1.0%	0.0 - 4.0%
Total	**$2,046,409.7**	**100.0%**	**100.0%**	**100.0%**	

ACTUAL %



TARGET %



TOTAL BV INVESTED AT 12/31/20			$ 16,865,751,243.07
January Activity			
	Purchases	2,437,030,442.65	
	Disposals	(2,485,192,852.40)	
	Paydowns	(3,299,495.67)	
	Redemptions	(16,591,022.59)	
	Short-Term Pool Net	466,423,583.17	
			398,370,655.16
February Activity			
	Purchases	1,093,520,431.58	
	Disposals	(611,062,839.36)	
	Paydowns	(3,812,755.26)	
	Redemptions	(22,500,273.21)	
	Short-Term Pool Net	(349,254,403.30)	
			106,890,160.45
March Activity			
	Purchases	797,288,668.36	
	Disposals	(642,384,931.01)	
	Paydowns	(4,602,953.85)	
	Redemptions	(8,225,243.93)	
	Short-Term Pool Net	(60,827,954.05)	
			81,247,585.52
TOTAL BV INVESTED AT 03/31/21			$ 17,452,259,644.20

* TRS recognizes investment transactions on the date they occur. Transaction settlements, generally, occur days following transactions. The interim period between transaction date and settlement date represents a "pending period". At the time this statement was produced, ($41,589,868.70) in net transactions had occurred but had not settled. The statement does not include either expected cash receipts or disbursements associated with these pending trades. Upon settlement of these pending transactions, the net effect would be as follows:

Total Short Term	1,203,744,375
- Pending Payable	41,589,869
Net	1,162,154,506

INVESTMENT ACTIVITY
January 1, 2021 -- March 31, 2021

Total Book Value Invested @ 01/1/21			$	16,865,751,243.07
Purchases:				
380	Cash Equivalents	$ 2,103,371,780.13		
284	Fixed Income Securities	910,674,628.48		
1	Principal Paydowns	0.11		
0	Redemptions / Maturities	-		
1397	Equity Securities	2,591,320,426.86		
32	Real Estate	110,487,373.62		
86	Alternative Investments	347,574,209.45		
287	Additional Categories	367,782,904.18		
2467	Total Purchases		$	6,431,211,322.83
Disposals:				
335	Cash Equivalents	$ 2,047,030,554.31		
73	Fixed Income Securities	343,123,106.46		
336	Principal Paydowns	11,715,204.89		
26	Redemptions / Maturities	39,883,530.13		
2569	Equity Securities	2,701,845,290.15		
32	Real Estate	12,082,584.60		
159	Alternative Investments	389,944,007.24		
214	Additional Categories	291,645,634.32		
0	Additional Principal Paydowns	-		
10	Additional Redemptions / Maturities	7,433,009.60		
3754	Total Disposals		$	5,844,702,921.70
Total Book Value Invested @ 03/31/21			$	17,452,259,644.20
Total Par Value Invested @ 03/31/21			$	17,457,279,138.66
Total Market Value Invested @ 03/31/21			$	24,532,406,316.84

* TRS recognizes investment transactions on the date they occur. Transaction settlements, generally, occur days following transactions. The interim period between transaction date and settlement date represents a "pending period". At the time this statement was produced, ($41,589,868.70 in net transactions had occurred but had not settled. The statement does not include either expected cash receipts or disbursements associated with these pending trades. Upon settlement of these pending transactions, the net effect would be as follows:

Total Short Term	1,230,744,375
- Pending Payable	41,589,869
Net	1,162,154,506

TO: Board of Trustees of the Teachers' Retirement System of the State of Kentucky

FROM: Gary L. Harbin, CPA
Executive Secretary

DATE: June 21, 2021

SUBJECT: Report of the Governance and Audit Committee

The Governance and Audit Committee met on June 11, 2021, to consider the annual report of the internal auditor and two reports from the executive secretary.

1. Internal Auditor's Report

A. Review of Fiscal Year 2021 Audit Summaries: The internal auditor reported to the committee on projects under the fiscal year 2021 audit plan. The report was informational, and the committee took no action.

B. Recommendation of Fiscal Year 2022 Audit Plan: The internal auditor presented a report on the proposed fiscal year 2022 audit plan. The committee approved the fiscal year 2022 audit plan.

2. Executive Secretary's Comments on Experience Study and Human Resources: The executive secretary presented two reports to the committee. The reports were informational, and the committee took no action.

Recommendation: The executive secretary recommends that the board accept the report of the committee.

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Teachers' Retirement System of the State of Kentucky
Experience Investigation for the
Five-Year Period Ending June 30, 2020

Ed Koebel, Chief Executive Officer
Alisa Bennett, President

June 21, 2021

Purpose of the Experience Study

- Over the short term, employer contributions are determined by the annual actuarial valuation based on estimated benefits, expenses and investment return using Assumptions and Funding Methods determined by the actuary and adopted by the Board through the Experience Study process.
- Over the long term, employer contributions are adjusted to reflect actual benefits, expenses and investment return.
- Selection of assumptions and methods that are too optimistic can result in costs being pushed to future generations, while assumptions and methods that are too pessimistic can put undue pressure on current resources.

Inputs

Member Data

Asset Data

Benefit Provisions

Assumptions

Funding Methods

↓

Results

Actuarial Value of Assets

Actuarial Accrued Liability

Net Actuarial Gain or Loss

Funded Ratio

Additional Disclosures

Projections

Experience Study Process
COVID-19

- No explicit changes were incorporated at this time due to the level of uncertainty regarding the effect of the pandemic on both health care costs and decremental experience such as mortality, retirement and disability

- We have considered available information but do not believe that there is yet sufficient data to warrant the further modification of any of the assumptions other than to retain margin in certain assumptions

- We will continue to monitor the situation as data emerges and advise the Board in the future of any adjustments that we believe would be appropriate

Our Philosophy

- Do Not Overreact
  - Typically, we do not make significant changes in actuarial assumptions unless a major event causes changes in expectations.
- Anticipate Trends
  - If an identified trend is expected to continue, like retiree mortality experience, then our assumptions should reflect these anticipated trends.
- Simplify
  - We identify which factors are significant and eliminate the ones that will not have a material impact on results.

Pension Determinations

- Significant Changes
  - Lower the investment return assumption for all plans to 7.10%
  - Lower the payroll growth assumption in the level percentage of payroll amortization methodology
  - Generational Mortality and update to new Public Sector Mortality Tables
- Moderate Changes
  - Lower the salary scale and change to be based on service instead of age
  - Increase the unused sick leave load at retirement
- Minor Changes
  - Retirement, Withdrawal and Disability Rates
  - Adopt an administrative expense assumption to add to normal cost each year
- No Changes
  - Actuarial Methods for Amortization of Unfunded Liability and Smoothing of Assets

Economic Assumptions

- Assumptions reviewed
  - Price inflation
  - Investment return
  - Wage inflation (for payroll-based plans)

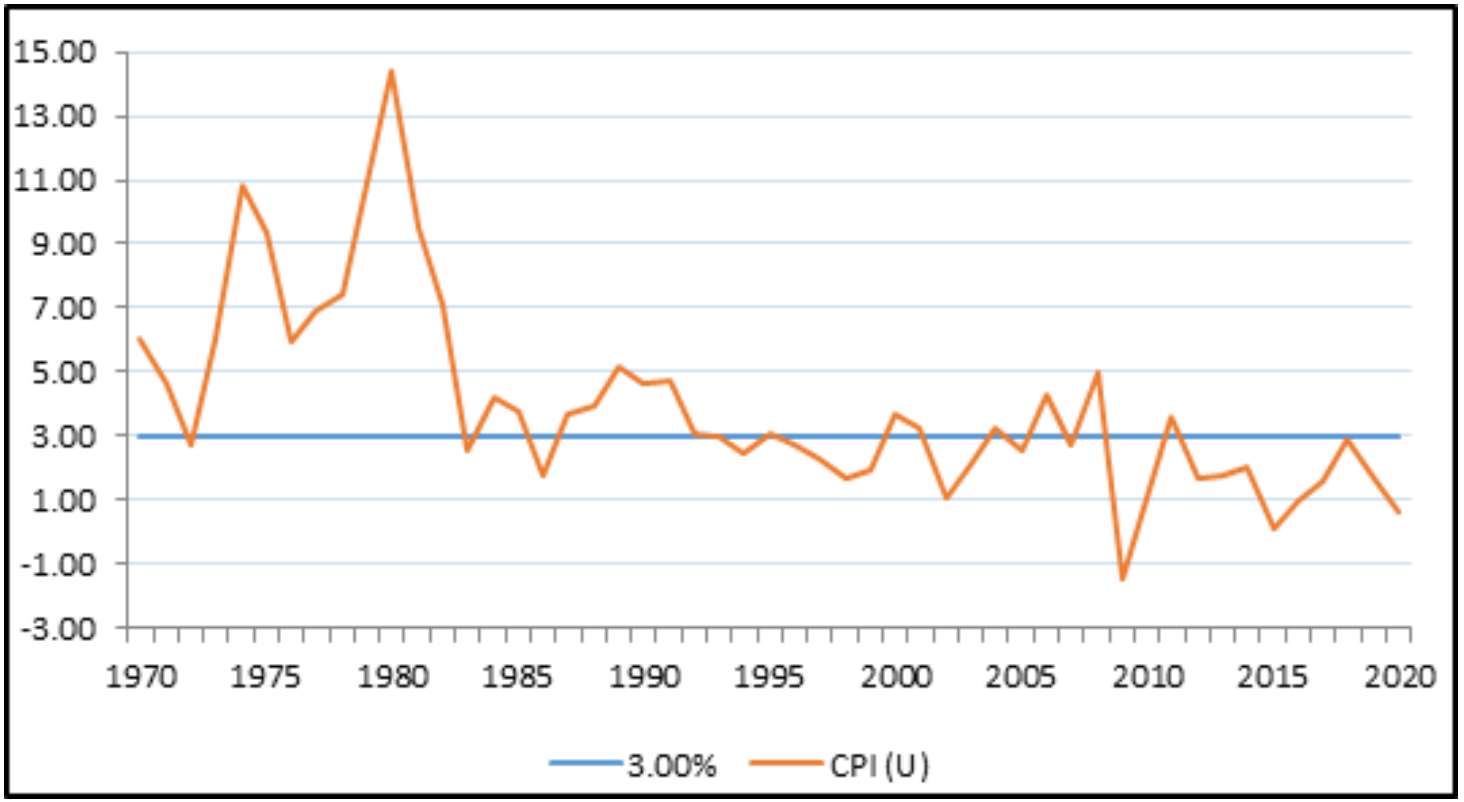
- Actuarial Standard of Practice (ASOP) No. 27, *"Selection of Economic Assumptions for Measuring Pension Obligations"* provides guidance to actuaries in selecting economic assumptions for measuring obligations under defined benefit plans
  - Specific assumptions must be set
  - Assumptions reflect actuary's professional judgment
  - Take into account historical and current economic data
  - Reflects actuary's estimate of future experience

Economic Assumptions

- Analysis may include:
  - Long term historical information
  - Recent experience
  - Forward looking modeling
  - Peer system comparison

Economic Assumptions
Price Inflation

- Current assumption: 3.00%
- Historical data: Annual CPI (U) Increases

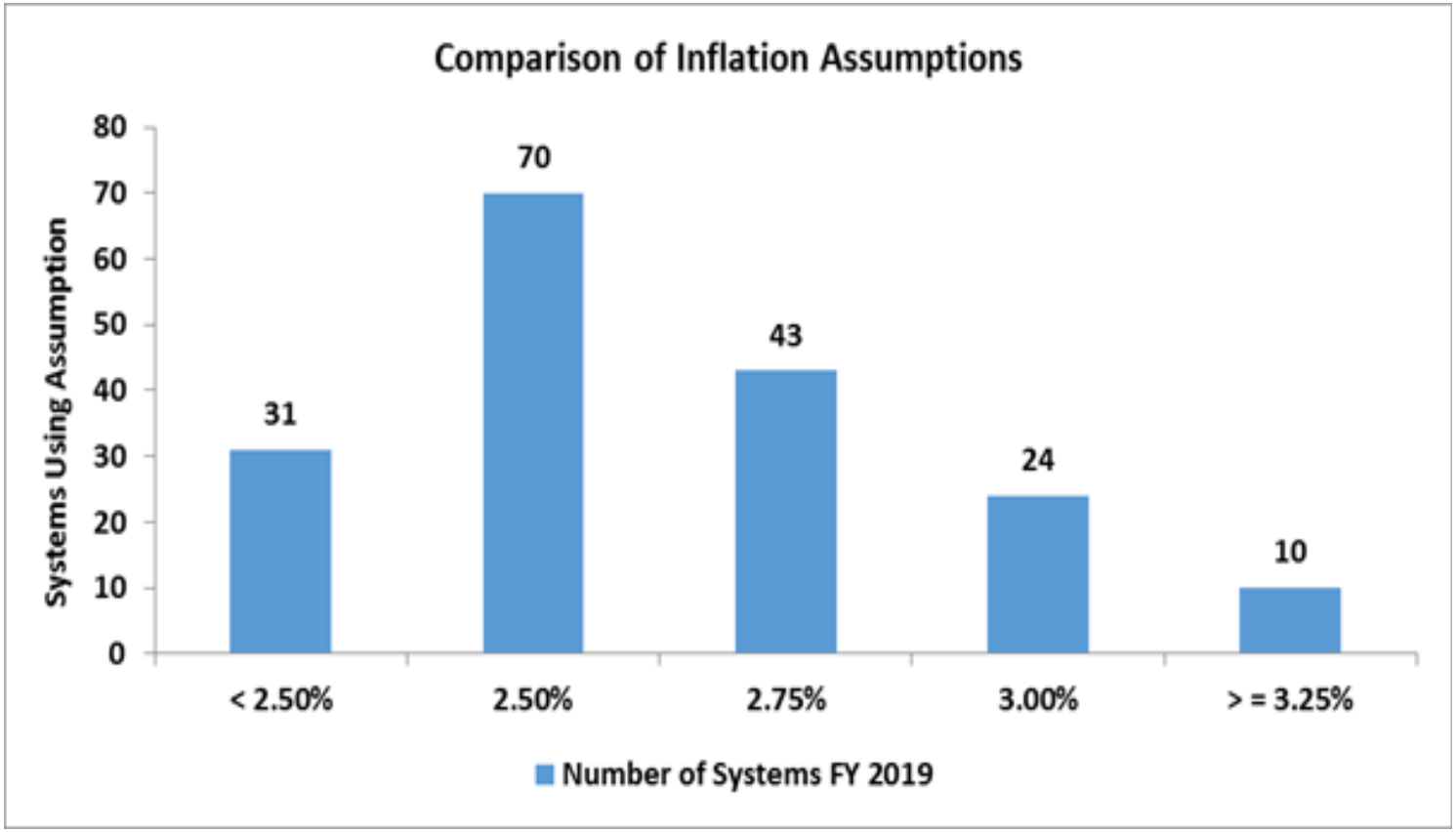


Economic Assumptions
Price Inflation

- Forecasts
  - Survey of Professional Forecasters as published by the Philadelphia Federal Reserve Bank
    - Median rate over the next ten years is 2.12%
  - National Association of Business Economics (NABE) forecast moderately higher inflation for remaining of 2021 and 2022 as we recover from the pandemic
    - Year-to-year inflation as of April 2021 is 4.2%
  - Social Security Administration
    - 2020 Chief Actuary's report
    - 75-year forecast at their best estimate cost is 2.40%

Economic Assumptions
Price Inflation

- Peer Comparison:



Economic Assumptions
Price Inflation

- Determination:

Price Inflation Assumption	
Current	3.00%
Social Security Range	1.80% - 3.00%
New	2.50%

Economic Assumptions
Investment Return

- Current Assumption:
  - Price inflation 3.00%
  - Real rate of return 4.50%
  - Total return (net of investment expenses) 7.50%

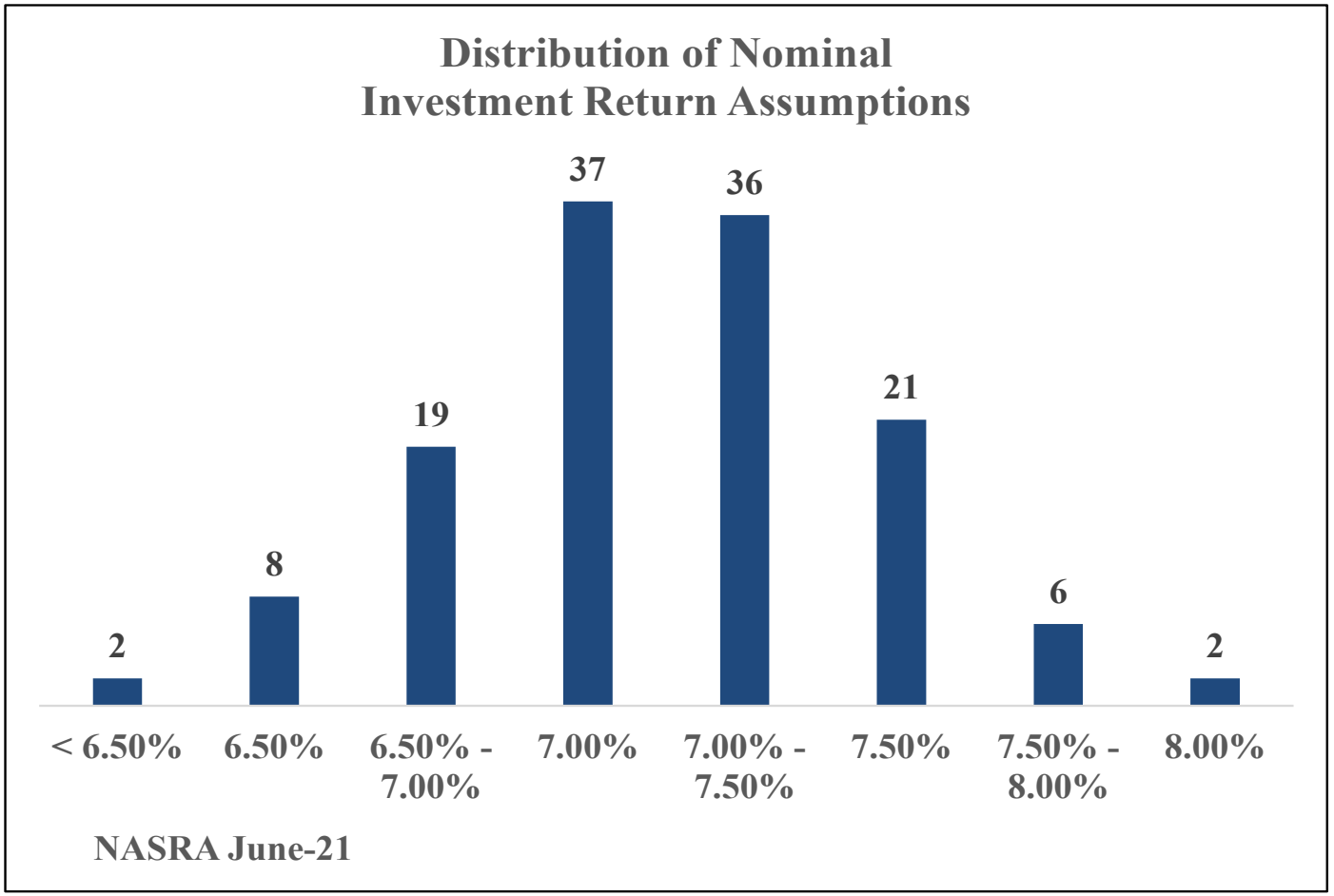
Nominal Total Rate of Return		
Year Ending 6/30	**Actuarial Value**	**Market Value**
2020	7.0%	5.5%
2019	7.1%	5.6%
2018	9.1%	10.5%
2017	9.3%	15.0%
2016	7.6%	-1.0%
Average	8.0%	7.1%

Setting Interest Rates
Building Block Method

- Using the CAPM assumptions (real rates of return net of investment expenses, standard deviations and correlation matrix) and asset allocation, we review lognormal distributions of assumptions
- Project range of returns over a long period (30 - 50 years)
- Select real rate of return from the range (usually near the 50% percentile return)
- Develop reasonable range for inflation assumption based on history and future expectations and select an inflation assumption within that range
- Combine the real return assumption and the inflation assumption to generate the nominal expected rate of return

Economic Assumptions
Investment Return

- Peer Comparison:



Economic Assumptions
Investment Return

- Determination:
  - ASOP No. 27 building block approach

Investment Return Assumption		
	Current	New
Real Rate of Return	4.50%	4.60%
Inflation	3.00%	2.50%
Net Investment Return	7.50%	7.10%

Economic Assumptions
Wage Inflation

- Current assumption: 3.50%, which is 0.50% above current price inflation
- Past Experience:

Period	Wage Inflation	Price Inflation	Real Wage Growth
2009-2019	2.88%	1.75%	1.13%
1999-2019	2.91%	2.14%	0.77%
1989-2019	3.36%	2.40%	0.96%
1979-2019	3.95%	3.07%	0.88%
1969-2019	4.53%	3.91%	0.62%

Economic Assumptions
Wage Inflation

- Social Security 75-year projection of national wage growth assumption is 1.1% greater than price inflation but that is heavily based on private sector and collectively bargained data
- However, TRS continues to experience gains on the salary assumption (actual increases are less than expected)
- Determination:

Wage Inflation Assumption		
	Current	New
Price Inflation	3.00%	2.50%
Real Wage Growth	0.50%	0.25%
Wage Inflation	3.50%	2.75%

- This assumption is for payroll growth in amortization of unfunded liability as well

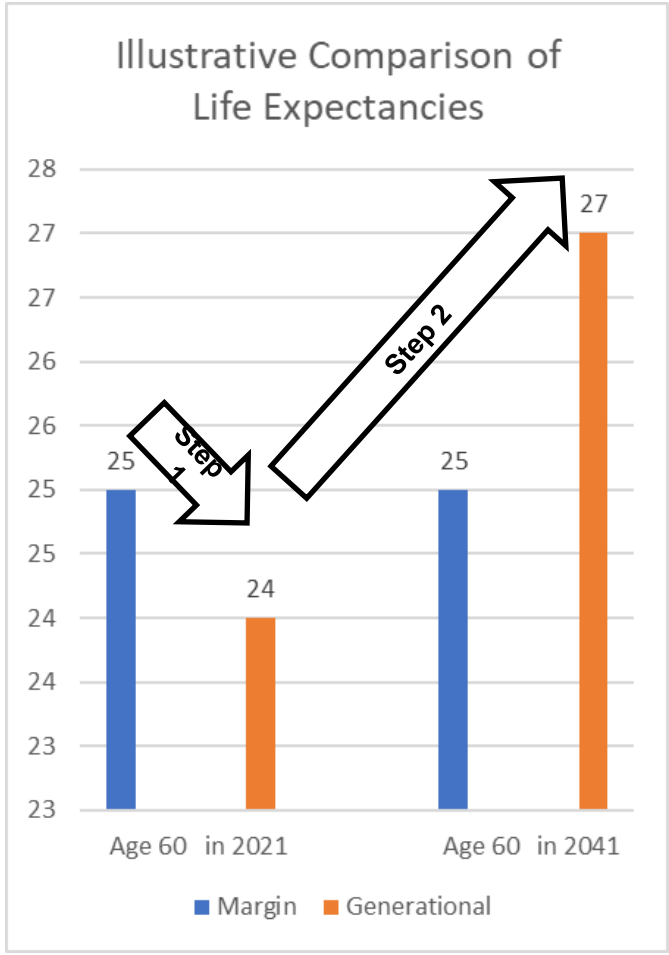
Demographic Assumptions

- Assumptions Reviewed
  - Rates of Mortality
  - Rates of Withdrawal
  - Rates of Disability Retirement
  - Rates of Service Retirement
  - Rates of Salary Increase

- Actuarial Standard of Practice (ASOP) No. 35, *"Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations"*, which provides guidance to actuaries in selecting demographic assumptions for measuring obligations under defined benefit plans.

TRS Demographic Assumptions
Mortality

- Base Rates of Mortality
  - Current rates based on RP-2000 tables
    - Published by the Society of Actuaries (SOA) in 2000
  - New rates based on Pub-2010 tables
    - Published by the SOA in early 2019
    - Separate tables for Teachers
- Generational Approach
  - Explicit assumption that future generations live longer than current generation



TRS Financial Impact

Pension Results – Retirement Annuity Trust
($ in Thousands)

System	Valuation Results 2020	After All Changes
Unfunded Accrued Liability	$14,785,756	$17,737,927
Funding Ratio	58.4%	54.0%
Required Increase Rate	15.78%	24.46%
Discount Rate	7.50%	7.10%

Health Trust and Life Trust

- Many of the assumptions (e.g., mortality) are appropriately "shared" by the pension plan, the Health Insurance Trust (Health Trust), and the Life Insurance Trust (Life Trust)
  - Inflation
  - Payroll Growth Rate
  - Mortality
  - Retirement Rates
  - Disability Incidence Rates
  - Termination Rates

Health Trust and Life Trust

- The Health Trust and Life Trust showed similar long-term projections regarding economic assumptions compared to the Retirement Annuity Trust

- The asset allocation strategy for the Health Trust will be impacted by the lower cash flows due to the State not paying their portion of the shared responsibility contributions

- We have determined a decrease in the long-term expected return on assets assumption from 8.00% (Health Trust) and 7.50% (Life Trust) to 7.10%

Health Trust and Life Trust

- Key Drivers
  - Investment return
  - Rates of health care inflation
  - Rates of health care coverage election
  - Federal subsidies

Health Trust Determinations

- Significant Changes
  - Generational Mortality and update to new Public Sector Mortality Tables
  - Lower the investment return assumption for all plans to 7.10%
  - Lower the payroll growth assumption in the level percentage of payroll amortization methodology
  - Lower the inflation assumption, which leads to lower ultimate healthcare trend assumption

TRS Financial Impact

OPEB Results – Retiree Health Trust
($ in Thousands)

System	Valuation Results 2020	After All Changes
Unfunded Accrued Liability	$1,056,685	$1,409,364
Funding Ratio	61.7%	54.7%
Required Increase Rate	3.54%	4.52%
Discount Rate	8.00%	7.10%

TRS Financial Impact

OPEB Results – Life Insurance Trust
($ in Thousands)

System	Valuation Results 2020	After All Changes
Unfunded Accrued Liability	$29,965	$25,100
Funding Ratio	75.5%	78.6%
Required Increase Rate	0.08%	0.07%
Discount Rate	7.50%	7.10%

Next Steps

- Review and Accept the Determinations
- Change the Board Funding Policy to implement for the FY 2021 valuations
  - Many large systems phase-in such changes
- Produce new optional forms of payment and early retirement factors

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TEACHERS' Retirement System
TRS
KENTUCKY

TEACHERS' RETIREMENT SYSTEM OF THE STATE OF KENTUCKY STATEMENT OF RESULTS OF THE EXPERIENCE INVESTIGATION PREPARED AS OF JUNE 30, 2020

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June 21, 2021

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

Members of the Board:

An investigation of the economic assumptions and the mortality, service, compensation, and healthcare experience of active and retired members of the Teachers' Retirement System of the State of Kentucky (TRS) has been made covering the five-year period from July 1, 2015 to June 30, 2020. The study was based on the data submitted by TRS for the annual valuation. In preparing this report, we relied, without audit, on the data provided.

The purpose of the investigation was to assess the reasonability of the current TRS economic assumptions, demographic, and healthcare actuarial assumptions. As a result of the investigation, it has been determined that revised economic assumptions, demographic tables, and healthcare assumptions should be adopted by the Board for future use.

All rates of separation, mortality and salary increase at each age determined in this investigation are shown in the attached tables in Appendix D of this report. In the actuary's judgment, these rates are suitable for use until further experience indicates that modifications are desirable.

In order to prepare the results in this report we have utilized appropriate actuarial models that were developed for this purpose. These models use assumptions about future contingent events along with recognized actuarial approaches to develop the needed results.

We note that as we are preparing this report, the world is in the midst of a pandemic. The impact of the COVID-19 pandemic was considered in this experience review. However, no explicit changes were incorporated mainly due to the level of uncertainty surrounding the effect of the virus on both health care costs and decremental experience such as mortality, retirement, and disability. We have considered available information, but do not believe that there is yet sufficient data to warrant the further modification of any assumptions. We will continue to monitor the situation as data emerges and advise the Board in the future of any adjustments that we believe would be appropriate.

We hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board (ASB) and the Code of Professional Conduct and Qualification Standards for Public Statements of Actuarial Opinion of the American Academy of Actuaries.

We further certify that, in our opinion, the assumptions developed in this report satisfy Actuarial Standards of Practice, in particular No. 27 (Selection of Economic Assumptions for Measuring Pension Obligations) and No. 35 (Selection of Demographic and Other Non-economic Assumptions for Measuring Pension Obligations).

The experience investigation was performed by, and under the supervision of, independent actuaries who are members of the American Academy of Actuaries with experience in performing valuations for public retirement systems. The undersigned meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,

Edward J. Koebel, EA, FCA, MAAA
Chief Executive Officer

Alisa Bennett, FSA, EA, FCA, MAAA
President

Table of Contents

Section I – Executive Summary

The purpose of an actuarial valuation is to provide a timely best estimate of the ultimate costs of a retirement system. Actuarial valuations of the Teachers' Retirement System of the State of Kentucky (TRS) are prepared annually to determine the actuarial contribution rate required to fund the system on an actuarial reserve basis, (i.e., the current assets plus future contributions, along with investment earnings will be sufficient to provide the benefits promised by the system). The valuation requires the use of certain assumptions with respect to the occurrence of future events, such as death, termination of employment, retirement, and salary changes to estimate the obligations of the system.

The basic purpose of an experience study is to determine whether the actuarial assumptions currently in use have adequately anticipated the actual emerging experience. This information, along with the professional judgment of system personnel and advisors, is used to evaluate the appropriateness of continued use of the current actuarial assumptions. When analyzing experience and assumptions, it is important to recognize that actual experience is reported in the short term while assumptions are intended to be long-term estimates of experience. Therefore, actual experience is expected to vary from study period to study period, without necessarily indicating a change in assumptions is needed.

Cavanaugh Macdonald Consulting, LLC (CMC) has performed a study of the experience of each of the Plans under the TRS' Board of Trustees purview for the five-year period ending June 30, 2020. This report presents the results, analysis, and resulting determinations of our study. It is anticipated that the changes will first be reflected in the June 30, 2021 actuarial valuations.

These assumptions have been developed in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the applicable Actuarial Standards of Practice adopted by the Actuarial Standards Board (ASB). While the determined assumptions represent our best estimate of future experience, there are other reasonable assumption sets that could be supported by the results of this experience study. Those other sets of reasonable assumptions could produce liabilities and costs that are either higher or lower.

Our Philosophy

Similar to an actuarial valuation, the calculation of actual and expected experience is a fairly mechanical process, and differences between actuaries in this area are generally minor. However, the setting of assumptions differs, as it is more art than science. In this report, we have determined that changes should be made to certain assumptions. To explain our thought process, we offer a brief summary of our philosophy:

- **Do Not Overreact**: When we see significant changes in experience, we generally do not adjust our rates to reflect the entire difference. We will typically set rates somewhere between the old rates and the new experience. If the experience during the next study period shows similar results, we will likely recognize the trend at that point, or at least move further in the direction of the observed experience. On the other hand, if experience returns closer to its prior level, we will not have overreacted, possibly causing volatility in the actuarial contribution rates.

- **Anticipate Trends**: If there is an identified trend that is expected to continue, we believe that this should be recognized. An example is the retiree mortality assumption. It is an established trend that people are living longer. Therefore, we believe the best estimate of liabilities in the valuation should reflect the expected increase in life expectancy.

- **Simplify**: In general, we attempt to identify which factors are significant and eliminate or ignore those that do not materially improve the accuracy of the liability projections.

The following summarizes the findings and determinations with regard to the assumptions utilized for TRS. Detailed explanations are found in the sections that follow.

Economic Assumption Changes

Economic assumptions are some of the most visible and significant assumptions used in the valuation process. The items in the broad economy modeled by these assumptions can be very volatile over short periods of time, as clearly seen in the economic downturn in 2008 followed by the rebound in many financial markets in the years following. Our goal is to try to find the emerging long-term trends in the midst of this volatility so that we can then apply reasonable assumptions.

Most of the economic assumptions used by actuaries are developed through a building-block approach. For example, the expected return on assets is based on the expectation for inflation plus the expected real return on assets. At the core of the economic assumptions is the inflation assumption. As we discuss later in the report, based on the Chief Actuary of the Social Security Administration's view of long-term inflation, **we have determined that the price inflation assumption should be decreased from 3.00% to 2.50%**.

Section I – Executive Summary

We have also determined that there should be a decrease in the Retirement Annuity Trust long-term expected return on assets assumption from 7.50% to 7.10%, reflecting a 2.50% inflation assumption and a 4.60% real rate of return assumption. This will be discussed in detail later in this report, but a real rate of return of 4.60% is supported by the forecasting models developed using the Horizon Actuarial Services, LLC. Survey conducted in 2020 and the Board's target asset allocation.

As the Health Trust and Life Trust showed similar long-term projections to the Retirement Annuity Trust and because the asset allocation strategy for the Health Trust will be impacted by the lower cash flows due to the State not paying their portion of the shared responsibility contributions, **we have determined that a decrease in the long-term expected return on assets assumption from 8.00% (Health Trust) and 7.50% (Life Trust) to 7.10% should be made at this time**.

Finally, we have determined that the general wage inflation (payroll growth) assumption used as the underlying payroll growth for active member and used in the level percent of payroll amortization method should be decreased from 3.50% to 2.75%.

The following table summarizes the current and proposed economic assumptions:

Item	Current	Proposed
Price Inflation	3.00%	2.50%
Investment Return*		
Retirement Trust	7.50%	7.10%
Health Trust	8.00%	7.10%
Life Trust	7.50%	7.10%
Wage Inflation (Payroll Growth)	3.50%	2.75%

* Net of investment expenses only.

Although we have determined that a change in the set of economic assumptions is necessary, we recognize there may be other sets of economic assumptions that are also reasonable for purposes of funding TRS. For example, we have typically reflected conservatism to the degree we would classify as moderate. Actuarial Standards of Practice allow for this difference in approaches and perspective, as long as the assumptions are reasonable and consistent.

Section I – Executive Summary

Demographic Assumption Changes

In the experience study, actual experience for the study period is compared to that expected based on the current actuarial assumption. Historically, the analysis has most commonly been performed based on counts, i.e., each member is one exposure as to the probability of the event occurring and one occurrence if the event actually occurs. Comparing the actual incidence of the event to what was expected (called the Actual-to-Expected ratio, or A/E ratio) then provides the basis for our analysis. However, for some assumptions, the trend has been to use a liability-weighted methodology if it provides a more accurate fit. Since the cost of a retirement system is determined based on the liability of each member, weighting the decrements based on liability will provide a better correlation to the gains or losses that occur each year. We have used a liability-weighted methodology in analyzing the rates of withdrawal from active service and the rates of post-retirement mortality.

The issue of future mortality improvement is one that the actuarial profession has become increasingly focused on studying in recent years. This has resulted in changes to the relevant Actuarial Standard of Practice, ASOP 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*. This ASOP requires the pension actuary to make and disclose a specific recommendation with respect to future improvements in mortality after the valuation date. There have been significant improvements in longevity in the past, although there are different opinions about future expectations. We believe it is prudent to anticipate that the trend will continue to some degree in the future. Therefore, we believe it is appropriate to reflect future mortality improvement as part of the mortality assumption.

There are two widely used approaches for reflecting future improvements in mortality:

(1) Static table with "margin"
(2) Generational mortality

The first approach to reflecting mortality improvements is with the use of a static mortality table with "margin." Under this approach, the A/E ratio is intentionally targeted to be over 100% so that mortality can improve without creating actuarial losses. While there is no formal guidance as to the amount of margin required (how far above 100% is appropriate for the A/E ratio), we typically prefer to have a margin of around 10 to 14% at the core ages of the retired member. The goal is still for the general shape of the curve to be a reasonable fit to the observed experience. Depending on the magnitude and duration of actual mortality improvements in the future, the margin may decrease and eventually become insufficient. If that occurs, the assumption will need to be updated.

Another approach, referred to as generational mortality, directly anticipates future improvements in mortality by using a different set of mortality rates for each year of birth, with the rates for later years of birth assuming lower mortality than the rates for earlier years of birth. The varying mortality rates by year of birth create a series of tables that contain "built-in" mortality improvements, e.g., a member who turns age 65 in 2035 has a longer life expectancy than a member who turns age 65 in 2020. When using generational mortality, the A/E ratios for the observed experience are set near 100% since future mortality improvements will be taken into account directly in the actuarial valuation process.

As mentioned previously, for the mortality decrements, we also analyzed the experience using a liability-weighted approach. This is approximated by using the member's retirement benefit from the data collected. The exposure and actual occurrences are then multiplied by the benefit level to provide the liability-weighted experience. This approach is particularly insightful when analyzing experience from a non-homogenous group. While we reviewed the mortality experience on both a count and liability-weighted basis, we ultimately decided on the liability-weighted results to evaluate experience and develop a new mortality table.

The current post-retirement mortality assumption for healthy lives is a static table, the RP-2000 Combined Mortality Table projected to 2025 with projection scale BB and set forward 2 years for males and set forward 1 year for females. The results of the experience analysis indicate that this table provided a reasonable expectation of mortality for the past five years but there were consistent mortality losses in each of the last five valuations. **Therefore, we have determined that the TRS Board should adopt a generational mortality approach and utilize the mortality assumptions from the recently published Pub-2010 Public Mortality Plans Mortality Tables.**

While prior pension mortality tables have been based solely on private corporate and union retirement plans, these new tables, released in late 2018, are based entirely on public sector plan data. These tables are split by three membership types: Safety, Teachers, and General to reflect the observed differences in mortality patterns related to the three groups. Tables are further split for healthy retirees, disabled retirees, contingent beneficiaries, and employees. There are still other breakdowns in these tables for at, above or below median annuity values. We anticipate that this family of tables will be a good starting point in developing a mortality assumption.

More information will be discussed in the demographic section of this report.

The following is a general list of the other changes to the demographic assumptions for TRS.

- **Retirement: Minor adjustments in the rates of retirement to better match experience of the System.**

- **Disability: Decrease rates of disability retirement at all ages for both males and females.**

- **Withdrawal: Minor adjustments in the rates of withdrawal to better match experience of the System.**

- **Merit Salary Scale: Change in the merit salary scale to be based on service rather than age and a slight decreases in the merit salary scale to better match experience of the System.**

- **Pre-Retirement Mortality: Update to the Pub-2010 Teachers' Employee Mortality Table with adjustments.**

Section IV of this report will provide more detail to these demographic changes.

Actuarial Methods

The basic actuarial methodologies used in the valuation process include the:

- Actuarial Cost Method – Entry Age Normal
- Asset Valuation Method – 5-year smoothing
- Amortization Method – Level percentage of payroll with closed, separate bases

Based on our review, discussed in full detail in Section III of this report, no changes are needed in these actuarial methods at this time.

Other Pension Assumptions

Currently for TRS, there is no contribution made to pay the administrative expenses incurred each year. This results in losses to the System due to the expenses paid out each year. **After reviewing the total amount of administrative expenses for the past five years and the percentage of payroll, we have determined that an assumption of 0.32% of payroll should be used in the valuation and added to the total normal cost each year.** The following table shows actual percentages over the past five years:

($ in Thousands)

Year Ending June 30	Administrative Expenses	Annual Payroll	Percentage
2016	$8,636	$3,537,226	0.24%
2017	10,314	3,563,584	0.29%
2018	11,388	3,605,116	0.32%
2019	12,352	3,648,428	0.34%
2020	12,167	3,723,482	0.33%

Currently, we assume a load of 2.0% to all active liability for all unused sick leave added at retirement. TRS staff has supplied us with average service credits due to unused sick leave for those active members that retired in the last 4 years that were not in Local School Districts. The average unused sick leave credit for these individuals was approximately 0.50 years of service. For those active members retiring from the Local School Districts, Final Average Compensation is increased by the average additional payroll they received from their unused sick leave time. Average additional payroll for these members averaged around $13,500. Using these figures, we compute that the load for unused sick leave should be 3.0%, therefore, **we have determined that there should be an increase to the load from 2.0% to 3.0% for all active liability at the time of retirement.**

Section I – Executive Summary

Financial Impact

The following table highlights the impact of the changes on the Retirement Annuity Trust unfunded accrued liability (UAL), funding ratio and required increase rate for the actuarially determined employer contribution rate.

Pension Results – Retirement Annuity Trust
($ in Thousands)

System	Valuation Results 2020	After Demographic Changes Only	After All Changes
Unfunded Accrued Liability	$14,785,756	$16,091,067	$17,737,927
Funding Ratio	58.4%	56.4%	54.0%
Required Increase Rate	15.78%	18.63%	24.46%
Discount Rate	7.50%	7.50%	7.10%

In addition, we reviewed the financial impact of the changes on the UAL, funding ratio and employer annual required contribution rate for the Retiree Health and Life Insurance Trusts. Section V in this report lists all the changes to the health assumptions specific to only the Retiree Health Trust and the Life Insurance Trust.

OPEB Results – Retiree Health Trust
($ in Thousands)

System	Valuation Results 2020	After Demographic Changes Only	After All Changes
Unfunded Accrued Liability	$1,056,685	$1,226,558	$1,409,364
Funding Ratio	61.7%	58.1%	54.7%
Required Increase Rate	3.54%	3.95%	4.52%
Discount Rate	8.00%	8.00%	7.10%

OPEB Results – Life Insurance Trust
($ in Thousands)

System	Valuation Results 2020	After Demographic Changes Only	After All Changes
Unfunded Accrued Liability	$29,965	$19,301	$25,100
Funding Ratio	75.5%	82.7%	78.6%
Required Increase Rate	0.08%	0.06%	0.07%
Discount Rate	7.50%	7.50%	7.10%

Section II – Economic Assumptions

There are four economic assumptions used in the actuarial valuations performed for TRS. They are:

- Price Inflation
- Investment Return
- Wage Inflation
- Payroll Growth for Amortization Method

Note that future price inflation has an indirect impact on the results of the actuarial valuation through the development of the assumptions for investment return and wage inflation. However, it is not directly used in the valuation process.

Actuarial Standard of Practice (ASOP) No. 27, *"Selection of Economic Assumptions for Measuring Pension Obligations"* provides guidance to actuaries in selecting economic assumptions for measuring obligations under defined benefit plans. ASOP No. 27 requires that each economic assumption selected by the actuary should be reasonable which means it has the following characteristics:

- It is appropriate for the purpose of the measurement;
- It reflects the actuary's professional judgment;
- It takes into account historical and current economic data that is relevant as of the measurement date;
- It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof; and
- It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included and disclosed, or when alternative assumptions are used for the assessment of risk.

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period.

Section II – Economic Assumptions

In our opinion, the economic assumptions determined in this report have been developed in accordance with ASOP No. 27. The following table shows the determined results followed by detailed discussions of each assumption.

Item	Current Assumptions	Proposed Assumptions
Price Inflation	3.00%	2.50%
Real Rate of Return*	4.50	4.60
Investment Return	7.50%	7.10%
Price Inflation	3.00%	2.50%
Real Wage Growth	0.50	0.25
Wage Inflation	3.50%	2.75%
Payroll Growth	3.50%	2.75%

* Net of investment expenses.

Section II – Economic Assumptions

Price Inflation

Background

As can be seen from the table on the previous page, assumed price inflation is used as the basis for both the investment return assumption and the wage inflation assumption. These latter two assumptions will be discussed in detail in the following sections.

It is important that the price inflation assumption be consistently applied throughout the economic assumptions utilized in an actuarial valuation. This is called for in ASOP No. 27 and is also required to meet the parameters for determining pension liabilities and expense under Governmental Accounting Standards Board (GASB) Statements No. 67 and 68.

The long-term relationship between price inflation and investment return has long been recognized by economists. The basic principle is that the investor demands a more or less level "real return" – the excess of actual investment return over price inflation. If inflation rates are expected to be high, investment return rates are also expected to be high, while low inflation rates are expected to result in lower expected investment returns, at least in the long run.

The current price inflation assumption is 3.00% per year.

Past Experience

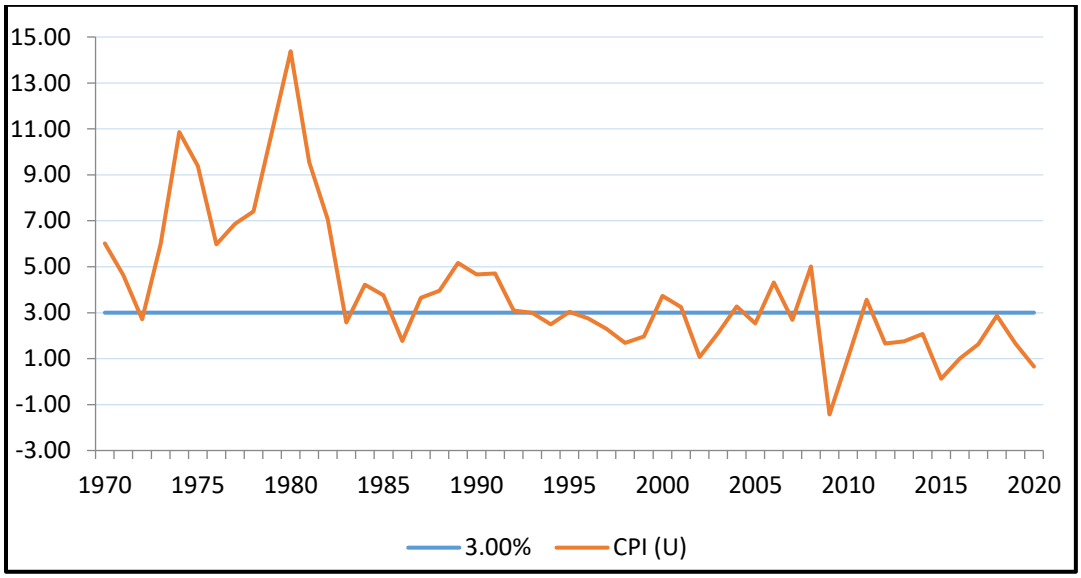
The Consumer Price Index, US City Average, All Urban Consumers, CPI (U), has been used as the basis for reviewing historical levels of price inflation. The table below provides historical annualized rates and annual standard deviation of the CPI-U over periods ending June 30th.

Period	Number of Years	Annualized Rate of Inflation	Annual Standard Deviation
1926 – 2020	94	2.87%	4.05%
1960 – 2020	60	3.67	2.88
1970 – 2020	50	3.86	3.02
1980 – 2020	40	2.88	1.89
1990 – 2020	30	2.31	1.36
2000 – 2020	20	2.03	1.48
2010 - 2020	10	1.69	1.00

Section II – Economic Assumptions

The following graph illustrates the historical levels of price inflation measured as of June 30th of each of the last 50 years and compared to the current 3.00% annual rate currently assumed.

Annual Rate of CPI (U) Increases



Over the last 30 years, the average annual rate of increase in the CPI-U has been below 2.50%. The volatility of the annual rates in the more recent years has been markedly lower as indicated by the significantly lower annual standard deviations.

Forecasts

Based upon information contained in the "Survey of Professional Forecasters" for the fourth quarter of 2020 as published by the Philadelphia Federal Reserve Bank, the median expected annual rate of inflation for the next ten years is 2.12%. Although 10 years of future expectation is too short of a period for the basis of our inflation assumption, the information does provide some evidence that the consensus expectations of these experts are for rates of inflation lower than our current assumption of 3.00% for the near-term future.

The latest forecast from the National Association for Business Economics (NABE) released in May 2021 shows its members largely agree that inflation will be moderately higher for the remaining of 2021 and 2022. In fact, the year-to-year CPI-U numbers for the end of April 2021 show an annual inflation rate of 4.2%, its highest one-year increase in years.

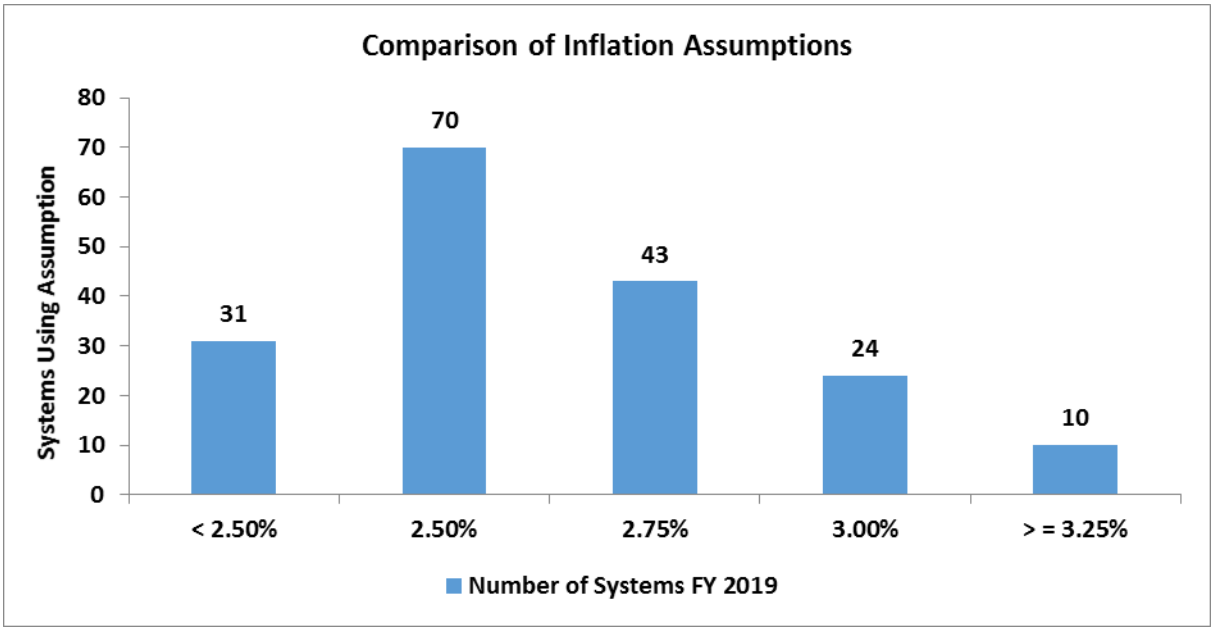
Section II – Economic Assumptions

Social Security Administration

Although economists have varying opinions on what inflation should be used by most retirement plans, they are generally looking at a shorter time perspective than is appropriate for a pension valuation. To consider a longer, similar time frame, we looked at the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the 2020 annual report, the projected ultimate average annual increase in the CPI over the next 75 years was estimated to be 2.40%, under the intermediate (best estimate) cost assumption. The range of inflation assumptions used in the Social Security 75-year modeling, which includes a low and high-cost scenario, in addition to the intermediate cost projection, was 1.80% to 3.00%.

Peer Comparison

While we do not base the selection of any assumption on what other systems use, it does provide another set of relevant information to consider. The following chart and graph show the inflation rate assumptions of 178 plans in the Public Plan Database of the Center for Retirement Research. The assumptions are from actuarial valuation reported in FYE 2019.



Section II – Economic Assumptions

Determination

It is difficult to predict inflation accurately. Inflation's short-term volatility is illustrated by comparing its average rate over the last 10 and 50 years. Although the 10-year average of 1.69% is lower than the System's assumed rate of 3.00%, the longer 40-year average of 2.88% is closer to TRS' current rate but it includes the very high rates of inflation from the early 1980s. Those high rates will not be part of the 40-year average for much longer. The reasonableness of TRS' assumption is, therefore, dependent upon the emphasis one assigns to the short and long-terms.

Current economic forecasts suggest lower inflation but are generally looking at a shorter time period than appropriate for our purposes. We consider the range included in the Social Security Administration of 1.80% to 3.00% with an intermediate assumption of 2.40% to be the most reasonable and have determined that the inflation assumption for TRS should be decreased from 3.00% to 2.50%.

Price Inflation Assumption	
Current	3.00%
Determined	2.50%

Section II – Economic Assumptions

Investment Return

Background

The assumed investment return is one of the most significant assumptions in the annual actuarial valuation process as it is used to discount the expected benefit payments for all active, inactive and retired members. Minor changes in this assumption can have a major impact on valuation results. The investment return assumption should reflect the asset allocation target for the funds set by the Board of Trustees.

The current assumption is 7.50%, consisting of a price inflation assumption of 3.00% and a real rate of return assumption of 4.50%.

Long Term Perspective

Because the economy is constantly changing, assumptions about what may occur in the near term are volatile. Asset managers and investment consultants usually focus on this near-term perspective in order to make prudent choices regarding how to invest the trust funds. For actuarial calculations, we typically consider very long periods of time. For example, a newly, hired employee who is 25 years old may work for 35 years, to age 60, and live another 30 years, to age 90 (or longer). The retirement system would receive contributions for the first 35 years and then pay out benefits for the next 30 years. During the entire 65-year period, the system is investing assets related to the member. For such a typical career employee, more than one-half of the investment income earned on assets accumulated to pay benefits is received after the employee retires. In addition, in an open, ongoing system like TRS, the stream of benefit payments is continually increasing as new hires replace current members who leave covered employment due to death, termination of employment, and retirement. This difference in the time perspective used by actuaries and investment consultants is frequently a source of debate and confusion when setting economic assumptions.

Past Experience

One of the inherent problems with analyzing historical data is that the results can look significantly different depending on the timeframe used, especially if the year-to-year results vary widely. In addition, the asset allocation can also impact the investment returns so comparing results over long periods when different asset allocations were in place may not be meaningful.

Section II – Economic Assumptions

The assets for TRS are valued using a widely accepted asset-smoothing methodology that fully recognizes the expected investment income and also recognizes 20% of each year's investment gain or loss (the difference between actual and expected investment income). The recent experience over the last five years is shown in the table below.

Year Ending 6/30	Actuarial Value	Market Value
2020	7.0%	5.5%
2019	7.1%	5.6%
2018	9.1%	10.5%
2017	9.3%	15.0%
2016	7.6%	-1.0%
Average	8.0%	7.1%

While important to review and analyze, historical returns over such a short time period are not credible for the purpose of setting the long-term assumed future rate of return.

Future Expectation Analysis

ASOP 27 provides that the actuary may rely on outside experts in setting economic assumptions. TRS utilizes the services of Aon to assist them in developing investment strategies and providing capital market assumptions for the TRS portfolio. As part of their duties, Aon periodically performs asset-liability studies, along with comprehensive reviews of the expected return of the various asset classes in which the TRS portfolio is invested. We believe it is appropriate to consider the results of Aon's work as one factor in assessing expected future returns.

Our forward-looking analysis used the real rates of return in Aon's capital market assumptions for 10-year and 30-year assumptions and TRS' target asset allocation. Using statistical projections that assume investment returns approximately follow a lognormal distribution with no correlation between years, produces an expected range of real rates of return over a 50-year time perspective. Looking at one year's results produces a reasonable mean real return, but also has a high standard deviation or measurement of volatility. By expanding the time perspective, the real return does not change, but the volatility declines significantly.

The tables below provide a summary of the results of Aon's 10-year and 30-year assumptions and TRS' target asset allocation.

Section II – Economic Assumptions

Aon 10-year perspective Assumptions

Time Span in Years	Mean Real Return	Standard Deviation	Real Returns by Percentile				
			5th	25th	50th	75th	95th
1	4.59%	13.67%	-16.29%	-5.02%	3.70%	13.22%	28.47%
5	3.88%	6.05%	-5.77%	-0.29%	3.70%	7.86%	14.12%
10	3.79%	4.27%	-3.09%	0.86%	3.70%	6.62%	10.97%
20	3.75%	3.02%	-1.15%	1.69%	3.70%	5.76%	8.79%
30	3.73%	2.47%	-0.27%	2.05%	3.70%	5.38%	7.84%
40	3.72%	2.14%	0.25%	2.27%	3.70%	5.15%	7.27%
50	3.72%	1.91%	0.61%	2.42%	3.70%	5.00%	6.89%

Aon 30-year perspective Assumptions

Time Span in Years	Mean Real Return	Standard Deviation	Real Returns by Percentile				
			5th	25th	50th	75th	95th
1	5.27%	13.67%	-15.62%	-4.33%	4.39%	13.91%	29.14%
5	4.57%	6.05%	-5.08%	0.40%	4.39%	8.54%	14.81%
10	4.48%	4.27%	-2.40%	1.55%	4.39%	7.31%	11.66%
20	4.43%	3.02%	-0.46%	2.37%	4.39%	6.45%	9.48%
30	4.42%	2.47%	0.41%	2.74%	4.39%	6.07%	8.53%
40	4.41%	2.14%	0.94%	2.96%	4.39%	5.84%	7.96%
50	4.41%	1.91%	1.30%	3.11%	4.39%	5.69%	7.58%

The percentile results are the percentages of random returns over the time span shown that are expected to be less than the amount indicated. For example, using the Aon 30-year perspective assumptions, for the 10-year time span, 5% of the resulting real rates of return will be below -2.40% and 95% will be above that. As the time span increases, the results begin to converge. Over a 50-year time span, the results indicate there will be a 25% chance that real returns will be below 3.11% and a 25% chance they will be above 5.69%. In other words, there is a 50% chance the real returns will be between 3.11% and 5.69%.

Section II – Economic Assumptions

The results of our real return forward looking analysis are very similar to the real rate of return analysis developed by Aon in their first quarter of 2021 analysis, where they developed a real return expectation of 4.30% over a 30-year perspective.

We also recognize that there can be differences of opinion among investment professionals regarding future return expectations. For a broader view of expected returns, we also reviewed the 2020 Survey of Capital Market Assumptions produced by Horizon Actuarial Services, LLC to see what other investment professionals are currently using for capital market assumptions.

The Horizon survey includes both 10-year perspective and 20-year perspective capital market assumptions. We applied the same statistical analysis to these survey results as we did the capital market assumption of TRS investment advisor with the following real return results for the 10-year perspective and 20-year perspective. This information provides an additional perspective on what a broad group of investment experts anticipate for future investment returns.

Horizon Survey 10-year perspective

Time Span in Years	Mean Real Return	Standard Deviation	Real Returns by Percentile				
			5th	25th	50th	75th	95th
1	5.12%	12.69%	-14.37%	-3.77%	4.36%	13.18%	27.20%
5	4.51%	5.63%	-4.48%	0.64%	4.36%	8.22%	14.02%
10	4.44%	3.97%	-1.97%	1.72%	4.36%	7.07%	11.10%
20	4.40%	2.81%	-0.15%	2.49%	4.36%	6.27%	9.08%
30	4.39%	2.29%	0.66%	2.83%	4.36%	5.92%	8.20%
40	4.38%	1.99%	1.15%	3.03%	4.36%	5.71%	7.68%
50	4.38%	1.78%	1.48%	3.17%	4.36%	5.57%	7.32%

Section II – Economic Assumptions

Horizon Survey 20-year perspective

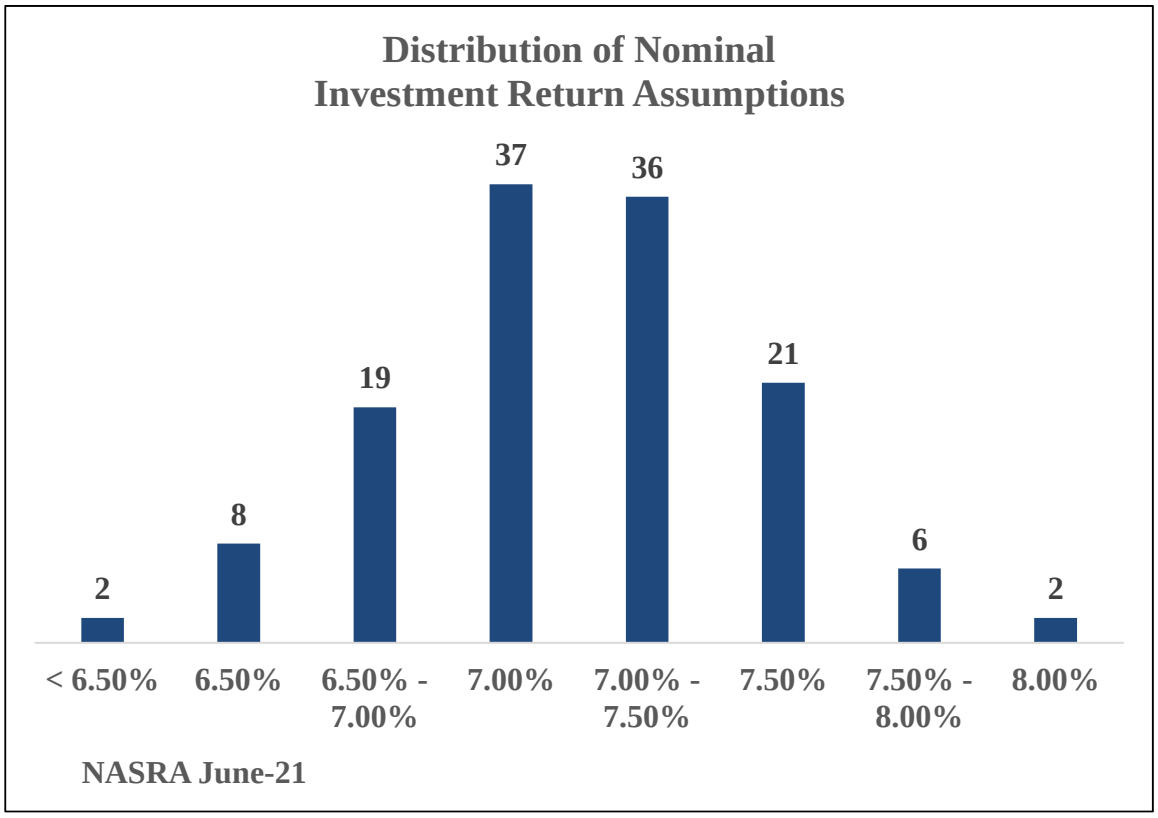
Time Span in Years	Mean Real Return	Standard Deviation	Real Returns by Percentile				
			5th	25th	50th	75th	95th
1	5.78%	12.69%	-13.73%	-3.11%	5.02%	13.84%	27.85%
5	5.17%	5.63%	-3.82%	1.30%	5.02%	8.88%	14.68%
10	5.10%	3.97%	-1.31%	2.38%	5.02%	7.74%	11.76%
20	5.06%	2.81%	0.50%	3.15%	5.02%	6.93%	9.74%
30	5.05%	2.29%	1.32%	3.49%	5.02%	6.58%	8.86%
40	5.04%	1.99%	1.81%	3.69%	5.02%	6.37%	8.34%
50	5.04%	1.78%	2.14%	3.83%	5.02%	6.23%	7.98%

As you can see from the two tables above, setting a real return assumption depends on the time perspective a plan seeks. The 20-year perspective is approximately 0.65% higher at all percentiles than the 10-year perspective. While TRS is a long-term vehicle expected to pay benefits to its retirees for many years in the future, a high percentage of the present value of the benefits is determined within the next ten to fifteen years, so the real return assumption should fall within the bands shown in the 50th percentile columns in the four tables above.

Section II – Economic Assumptions

Peer Comparison

The following chart shows the nominal investment return assumptions of 131 plans in the National Association of State Retirement Administrators (NASRA). The assumptions shown below are as of June 2021 and are updated frequently by the NASRA staff.



Section II – Economic Assumptions

Determination

By actuarial standards, we are required to maintain a long-term perspective in setting all assumptions, including the investment return assumption. Therefore, we believe we must be careful not to let recent experience or the short-term expectations impact our judgment regarding the appropriateness of the current assumption over the long term.

Based on our analysis of the Board's target asset allocation and the Horizon Survey capital market assumptions, we have determined a change should be made to the real return assumption from 4.50% to 4.60%. This assumption of 4.60% is approximately midway between the 10-year perspective (4.36%) and the 20-year perspective (5.02%) from the Horizon Survey. Based on an inflation assumption of 2.50% and real return assumption of 4.60%, we have determined a 7.10% expected long term nominal rate of return assumption.

Investment Return Assumption		
	Current	**Proposed**
Real Rate of Return*	4.50%	4.60%
Inflation	3.00	2.50
Net Investment Return	7.50%	7.10%

* Net of investment expenses.

Section II – Economic Assumptions

Wage Inflation

Background

The wage inflation assumption is composed of the price inflation assumption and an assumption for the real rate of wage increases. The salary increase assumption combines the wage inflation assumption with an assumption for promotion and longevity, often called merit increases. Merit assumptions are generally age and or service related and will be discussed in the demographic assumption section of the report. The excess of wage growth over price inflation is also considered the increase in productivity that labor provides.

The current wage inflation assumption is 3.50% and is composed of a 3.00% rate of inflation assumption and a 0.50% real rate of wage inflation.

Past Experience

The Social Security Administration publishes data on wage growth in the United States (see Appendix C). While this is the most comprehensive data available, it is based on all wage earners in the country so it can be influenced by the mix of jobs as well as by changes in certain sectors of the workforce that may not be seen by all segments.

As with our analysis of inflation, we provide below wage inflation and a comparison with price inflation over various time periods. Currently, this wage data is only available through calendar year 2019. We remove the rate of price inflation for each year from the data to result in the historical real rate of wage inflation.

Period	Wage Inflation	Price Inflation	Real Wage Growth
2009-2019	2.88%	1.75%	1.13%
1999-2019	2.91%	2.14%	0.77%
1989-2019	3.36%	2.40%	0.96%
1979-2019	3.95%	3.07%	0.88%
1969-2019	4.53%	3.91%	0.62%

Thus, over the last 50 years, annual real wage growth has averaged 0.62%.

Section II – Economic Assumptions

Social Security Administration

The wage index used for the historical analysis is projected forward by the Office of the Chief Actuary of the Social Security Administration in their 75-year projections. In April of 2020, the annual increase in the National Average Wage Index under the intermediate cost assumption (best estimate) was 3.54%, 1.14% higher than the Social Security intermediate inflation assumption of 2.40% per year. The range of the assumed real wage inflation in the 2020 Trustees report was 0.52% to 1.76% per year.

Determination

The data the Social Security Administration collects is nationwide and predominantly from the private sector which includes many collectively bargained employees. It is questionable whether public sector employees can match the productivity rates of the private sector. In addition, the experience of real wage growth for teachers in the State of Kentucky is below the national average. **Therefore, we have determined that the real wage growth inflation assumption should be reduced from 0.50% to 0.25%. This change along with reflecting the decrease in the price inflation assumption results in a reduction to total wage inflation growth from 3.50% to 2.75%.**

Wage Inflation Assumption		
	Current	Proposed
Price Inflation	3.00%	2.50%
Real Wage Growth	0.50%	0.25%
Wage Inflation	3.50%	2.75%

Section II – Economic Assumptions

Payroll Growth

Background

The assumed future rate of payroll growth increase in the total payroll of TRS' active members is an assumption used in the level percentage of payroll amortization method that affects the calculation of the amortization period required to fully amortize the unfunded actuarial accrued liability and the actuarially determined employer contribution. The total payroll growth is impacted by individual member's increases and population growth. The current assumption is 3.50% per year which is equal to the current wage inflation assumption.

Past Experience

The following table shows the actual TRS' annual payroll growth experienced over different time periods.

Period	Number of Years	Annual Payroll Growth
1990 – 2020	30	3.46%
2000 – 2020	20	2.82%
2005 – 2020	15	2.16%
2010 – 2020	10	1.15%
2015 – 2020	5	1.16%

Determination

The table above shows that since 1990 annual payroll growth has been near assumed levels. However, over the past 10 to 15 years, annual payroll growth has been much lower than assumed. This is a direct result of the financial crisis of 2008/2009. Projections for population growth in the State of Kentucky are encouraging as some counties are growing significantly, including Scott, Warren and Boone counties and one-third of the growth in the state since 2000 has occurred in the Louisville area. The need for attracting and retaining teachers to any state is tied to the population growth and the ability to pay teachers more. **Taking all of this information into account, we have determined that the payroll growth assumption should be set at 2.75%, which is a 0.75% reduction in the current assumption of 3.50%.**

Section III – Actuarial Methods

ACTUARIAL COST METHOD

There are various actuarial cost methods, each of which has different characteristics, advantages and disadvantages. However, Governmental Accounting Standard Board (GASB) Statement Numbers 67 and 68 require that the Entry Age Normal cost method be used for financial reporting. Most systems do not want to use a different actuarial cost method for funding and financial reporting. In addition, the Entry Age Normal method has been the most common funding method for public systems for many years. This is the cost method currently used by TRS.

The rationale of the Entry Age Normal (EAN) cost method is that the cost of each member's benefit is determined to be a level percentage of his salary from date of hire to the end of his employment with the employer. This level percentage multiplied by the member's annual salary is referred to as the normal cost and is that portion of the total cost of the employee's benefit that is allocated to the current year. The portion of the present value of future benefits allocated to the future is determined by multiplying this percentage times the present value of the member's assumed earnings for all future years including the current year. The Entry Age Normal actuarial accrued liability is then developed by subtracting from the present value of future benefits that portion of costs allocated to the future. To determine the unfunded actuarial accrued liability, the value of plan assets is subtracted from the Entry Age Normal actuarial accrued liability. The current year's cost to amortize the unfunded actuarial accrued liability is developed by applying an amortization factor.

It is to be expected that future events will not occur exactly as anticipated by the actuarial assumptions in each year. Actuarial gains/losses from experience under this actuarial cost method can be directly calculated and are reflected as a decrease/increase in the unfunded actuarial accrued liability. Consequently, the gain/loss results in a decrease/increase in the amortization payment, and therefore the contribution rate.

Considering that the Entry Age Normal cost method is the most commonly used cost method by public plans, that it develops a normal cost rate that tends to be stable and less volatile and is the required cost method under calculations required by GASB Numbers 67 and 68, **we have determined that the Entry Age Normal actuarial cost method should be retained for TRS.**

Section III – Actuarial Methods

ACTUARIAL VALUE OF ASSETS

In preparing an actuarial valuation, the actuary must assign a value to the assets of the fund. An adjusted market value is often used to smooth out the volatility that is reflected in the market value of assets. This is because most employers would rather have annual costs remain relatively smooth, as a percentage of payroll or in actual dollars, as opposed to a cost pattern that is extremely volatile.

The actuary does not have complete freedom in assigning this value. The Actuarial Standards Board also has basic principles regarding the calculation of a smoothed asset value, Actuarial Standard of Practice No. 44 (ASOP 44), *Selection and Use of Asset Valuation Methods for Pension Valuations.*

ASOP 44 provides that the asset valuation method should bear a reasonable relationship to the market value. Furthermore, the asset valuation method should be likely to satisfy both of the following:

- Produce values within a reasonable range around market value, AND
- Recognize differences from market value in a reasonable amount of time.

In lieu of both of the above, the standard will be met if either of the following requirements is satisfied:

- There is a sufficiently narrow range around the market value, OR
- The method recognizes differences from market value in a sufficiently short period.

These rules or principles prevent the asset valuation methodology from being used to manipulate annual funding patterns. No matter what asset valuation method is used, it is important to note that, like a cost method or actuarial assumptions, the asset valuation method does not affect the true cost of the plan; it only impacts the incidence of cost.

Currently, the actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected market value of assets, based on the assumed valuation rate of return. The amount recognized each year is 20% of the difference between market value and expected market value. **We have determined that there should be no change in this methodology.**

Section III – Actuarial Methods

AMORTIZATION OF THE UNFUNDED ACTUARIAL ACCRUED LIABILITY

The actuarial accrued liability is the portion of the actuarial present value of future benefits that are not included in future normal costs. Thus, it represents the liability that, in theory, should have been funded through normal costs for past service. Unfunded actuarial accrued liability (UAAL) exists when the actuarial accrued liability exceeds the actuarial value of plan assets. These deficiencies can result from:

(i) plan improvements that have not been completely paid for,
(ii) experience that is less favorable than expected,
(iii) assumption changes that increase liabilities, or
(iv) contributions that are less than the actuarial contribution rate.

There are a variety of different methods that can be used to amortize the UAAL. Each method results in a different payment stream and, therefore, has cost implications. For each methodology, there are three characteristics:

- The period over which the UAAL is amortized,
- The rate at which the amortization payment increases, and
- The number of components of UAAL (separate amortization bases).

Amortization Period: The amortization period can be either closed or open. If it is a closed amortization period, the number of years remaining in the amortization period declines by one in each future valuation. Alternatively, if the amortization period is an open or rolling period, the amortization period does not decline but is reset to the same number each year. This approach essentially "refinances" the System's debt (UAAL) every year.

Amortization Payment: The level dollar amortization method is similar to the method in which a homeowner pays off a mortgage. The liability, once calculated, is financed by a constant fixed dollar amount, based on the amortization period until the liability is extinguished. This results in the liability steadily decreasing while the payments, though remaining level in dollar terms, in all probability decrease as a percentage of payroll. (Even if a plan sponsor's population is not growing, inflationary salary increases will usually be sufficient to increase the aggregate covered payroll).

The rationale behind the level percentage of payroll amortization method is that since normal costs are calculated to be a constant percentage of pay, the unfunded actuarial accrued liability should be paid off in the same manner. When this method of amortizing the unfunded actuarial accrued

liability is adopted, the initial amortization payments are lower than they would be under a level dollar amortization payment method, but the payments increase at a fixed rate each year so that ultimately the annual payment far exceeds the level dollar payment. The expectation is that total payroll will increase at the same rate so that the amortization payments will remain constant, as a percentage of payroll. In the initial years, the level percentage of payroll amortization payment is often less than the interest accruing on the unfunded actuarial accrued liability meaning that even if there are no experience losses, the dollar amount of the unfunded actuarial accrued liability will grow (called negative amortization). This is particularly true if the plan sponsor is paying off the unfunded actuarial accrued liability over a long period, such as 20 or more years.

Amortization Bases: The UAAL can be amortized either as one single amount or as components or "layers", each with a separate amortization base, payment and period. If the UAAL is amortized as one amount, the UAAL is recalculated each year in the valuation and experience gains/losses or other changes in the UAAL are folded into the single UAAL amortization base. The amortization payment is then the total UAAL divided by an amortization factor for the applicable amortization period.

If separate amortization bases are maintained, the UAAL is composed of multiple amortization bases, each with its own payment schedule and remaining amortization period. In each valuation, the unexpected change in the UAAL is established as a new amortization base over the appropriate amortization period beginning on that valuation date. The UAAL is then the sum of all the outstanding amortization bases on the valuation date and the UAAL payment is the sum of all of the amortization payments on the existing amortization bases. This approach provides transparency in that the current UAAL is paid off over a fixed period of time and the remaining components of the UAAL are clearly identified. Adjustments to the UAAL in future years are also separately identified in each future year. One downside of this approach is that it can create some discontinuities in contribution rates when UAAL layers/components are fully paid off. If this occurs, it likely would be far in the future, with adequate time to address any adjustments needed.

Determination

The methodology in calculating the Actuarially Determined Contribution is as follows:

- Amortization Period – Closed period with maximum period of 20 years for new bases
- Amortization Payment – Level Percentage of Payroll
- Amortization Bases – Separate bases for all experience gains and losses, assumption changes or benefit changes

We have determined that no changes should be made to these methods.

Section IV – Demographic Assumptions

There are several demographic assumptions used in the actuarial valuations performed for TRS. They are:

- Rates of Withdrawal
- Rates of Disability Retirement
- Rates of Service Retirement
- Rates of Mortality
- Rates of Salary Increase

The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 35, *"Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations,"* which provides guidance to actuaries in selecting demographic assumptions for measuring obligations under defined benefit plans. In our opinion, the demographic assumptions determined in this report have been developed in accordance with ASOP No. 35.

The purpose of a study of demographic experience is to compare what actually happened to the membership during the study period (July 1, 2015 through June 30, 2020) with what was expected to happen based on the assumptions used in the most recent Actuarial Valuations.

Detailed tabulations by age, service and/or gender are performed over the entire study period. These tabulations look at all active and retired members during the period as well as separately annotating those who experience a demographic event, also referred to as a decrement. In addition, the tabulation of all members together with the current assumptions permits the calculation of the number of expected decrements during the study period.

If the actual experience differs significantly from the overall expected results, or if the pattern of actual decrements, or rates of decrement, by age, gender, or service does not follow the expected pattern, new assumptions are determined. Changes to assumptions usually do not follow the exact actual experience during the observation period. Judgment is required to extrapolate future experience from past trends and current member behavior.

The remainder of this section presents the results of the demographic study. We have prepared tables showing a comparison of the actual and expected decrements and the overall ratio of actual to expected results (A/E Ratios) under the current assumptions. If a change is being proposed, the revised A/E Ratios are shown as well. Salary adjustments, other than the economic assumption for wage inflation discussed in the previous section, are treated as demographic assumptions.

RATES OF WITHDRAWAL

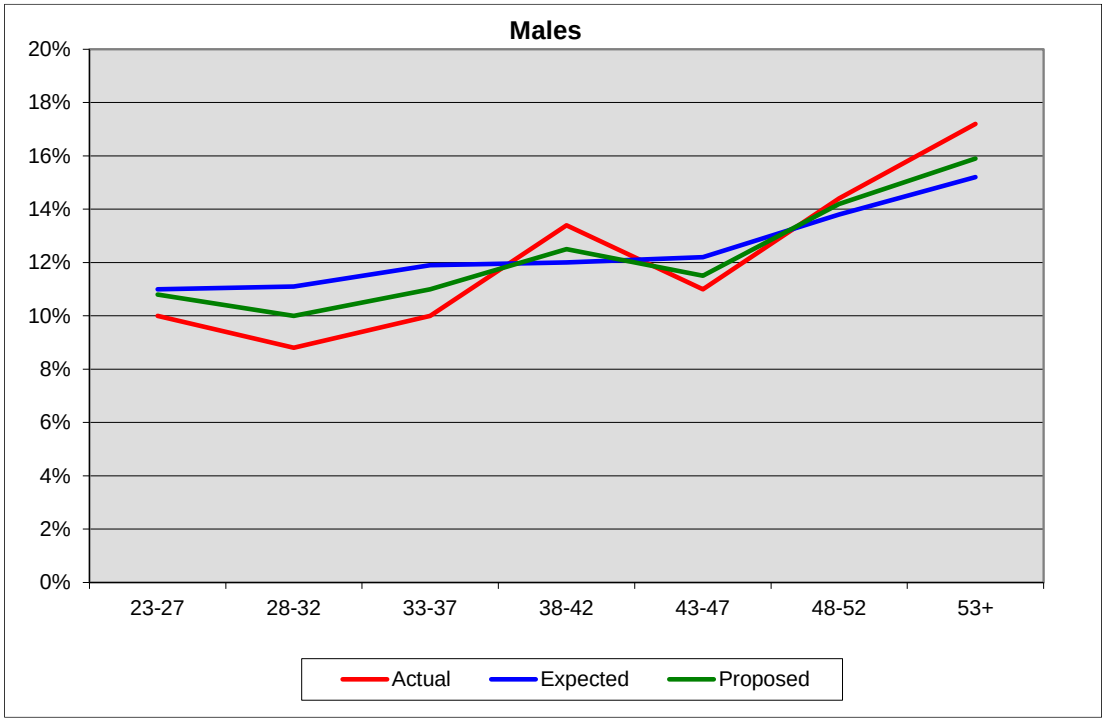
COMPARISON OF ACTUAL AND EXPECTED RATES OF WITHDRAWAL FROM ACTIVE SERVICE

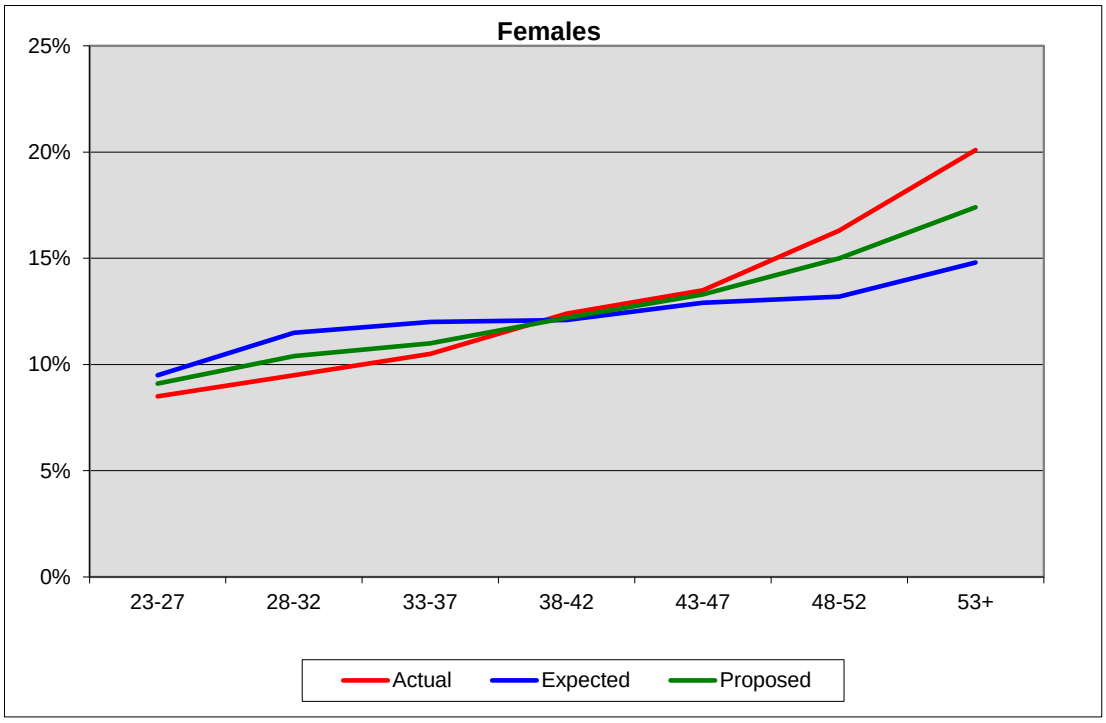
CENTRAL AGE OF GROUP	RATES OF WITHDRAWAL					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
	Withdrawals with less than 5 years of service					
20	0.263	0.110	2.391	0.155	0.088	1.761
25	0.100	0.110	0.909	0.085	0.095	0.895
30	0.088	0.111	0.793	0.095	0.115	0.826
35	0.100	0.119	0.840	0.105	0.120	0.875
40	0.134	0.120	1.117	0.124	0.121	1.025
45	0.110	0.122	0.902	0.135	0.129	1.047
50	0.144	0.138	1.043	0.163	0.132	1.235
53 & OVER	0.172	0.152	1.132	0.201	0.148	1.358
TOTAL	0.111	0.120	0.925	0.107	0.113	0.947
	Withdrawals with at least 5 but less than 10 years of service					
25	0.033	0.030	1.100	0.052	0.040	1.300
30	0.036	0.031	1.161	0.042	0.040	1.050
35	0.036	0.035	1.029	0.034	0.040	0.850
40	0.042	0.044	0.955	0.040	0.040	1.000
45	0.034	0.045	0.756	0.036	0.041	0.878
50	0.044	0.045	0.978	0.047	0.049	0.959
53 & OVER	0.075	0.044	1.705	0.057	0.050	1.140
TOTAL	0.040	0.038	1.053	0.040	0.041	0.976
	Withdrawals with 10 or more years of service					
30	0.032	0.025	1.280	0.009	0.016	0.563
35	0.016	0.015	1.067	0.017	0.015	1.133
40	0.013	0.014	0.929	0.012	0.013	0.923
45	0.010	0.014	0.714	0.009	0.012	0.750
50	0.010	0.019	0.526	0.012	0.015	0.800
53 & OVER	0.014	0.022	0.636	0.015	0.018	0.833
TOTAL	0.012	0.016	0.750	0.012	0.014	0.857

Section IV – Demographic Assumptions

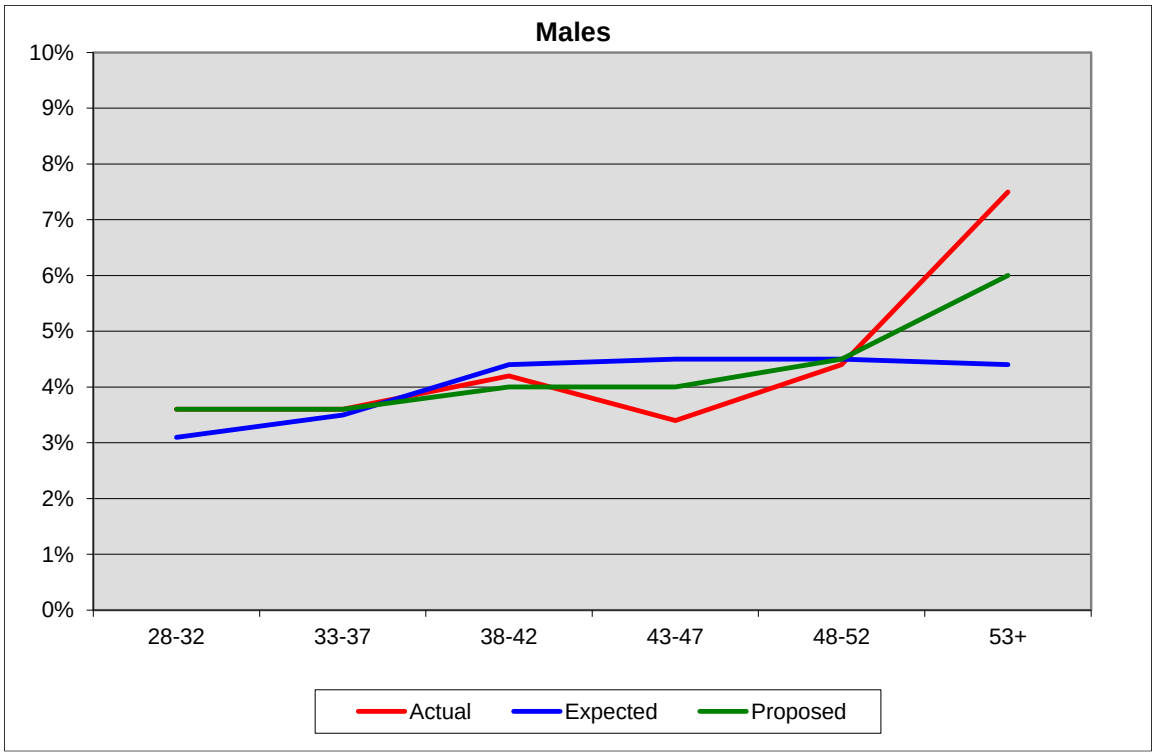
The following graphs show a comparison of the present, actual, and proposed rates of withdrawal for each of the service categories.

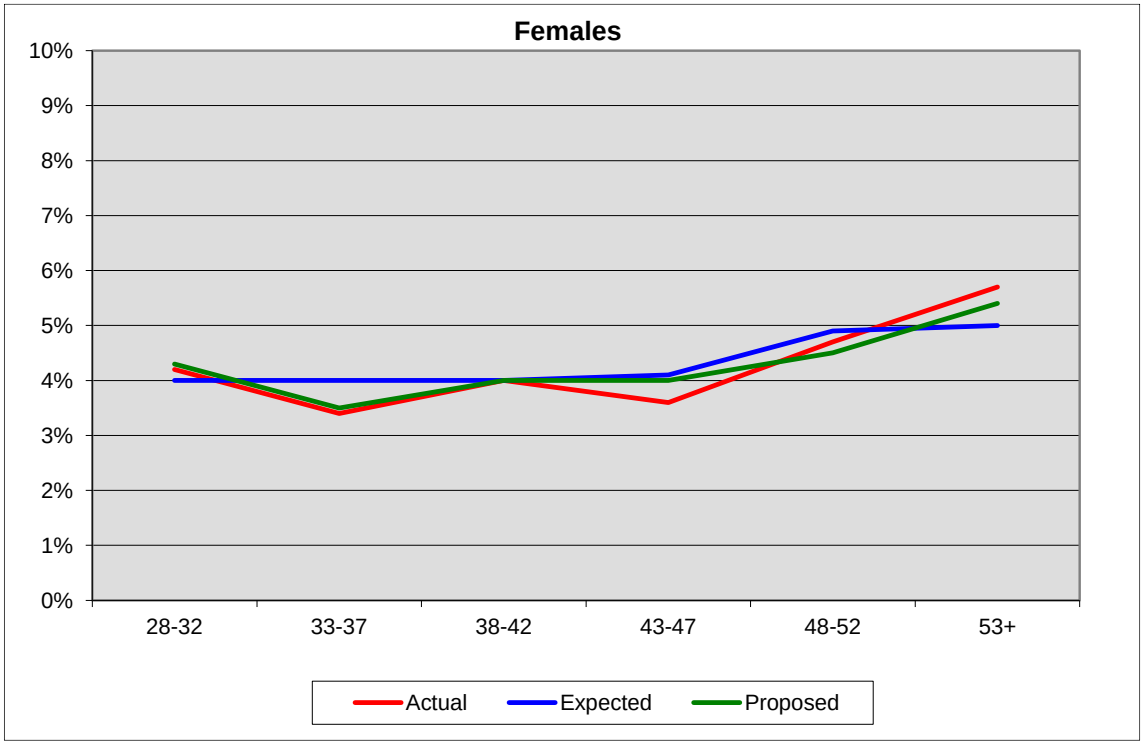
RATES OF WITHDRAWAL FOR ACTIVE MEMBERS WITH LESS THAN 5 YEARS OF SERVICE



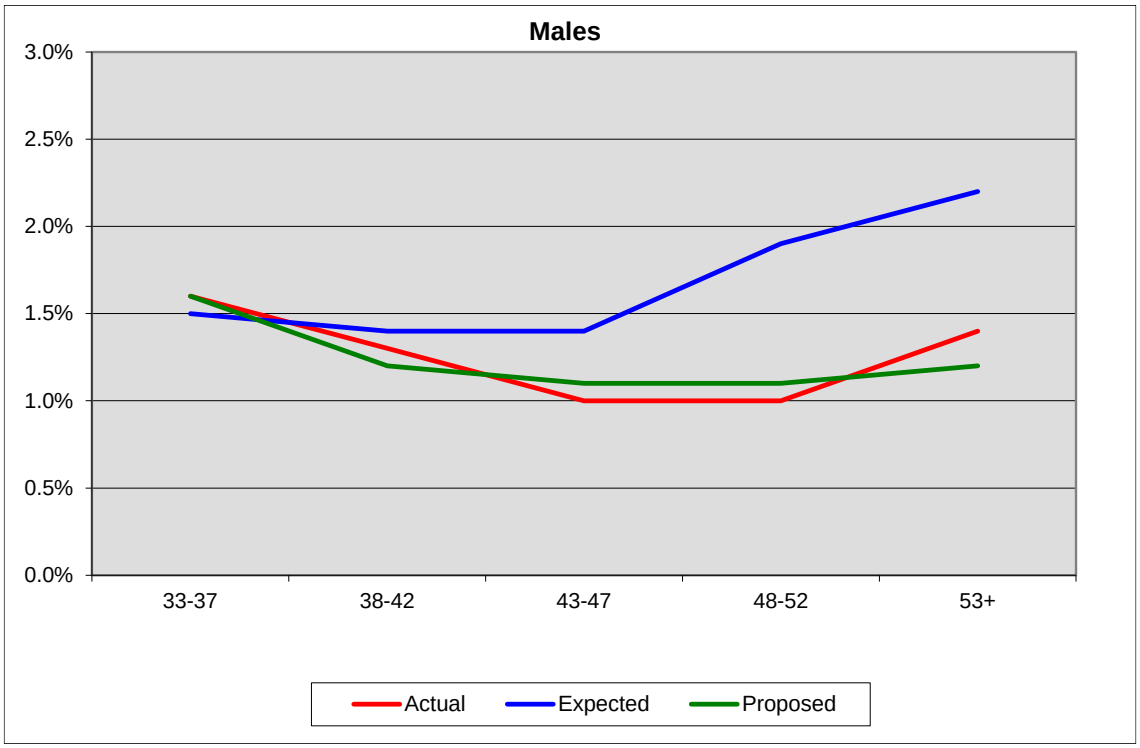


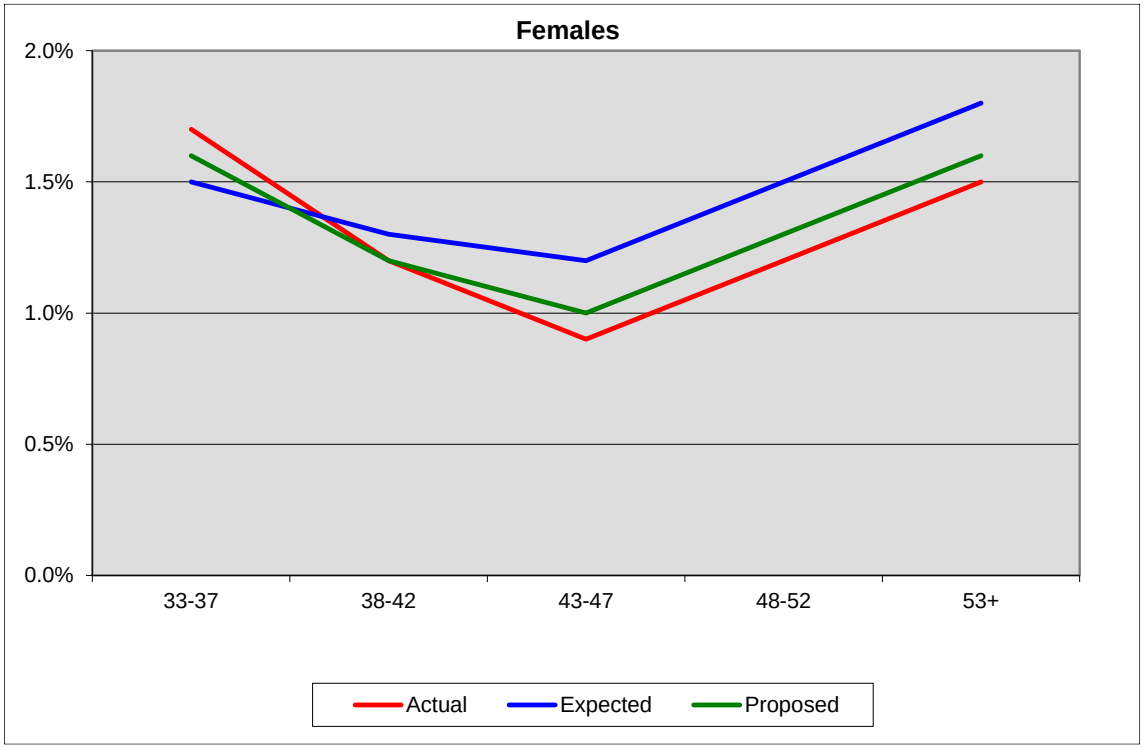
RATES OF WITHDRAWAL FOR ACTIVE MEMBERS WITH AT LEAST 5 BUT LESS THAN 10 YEARS OF SERVICE





RATES OF WITHDRAWAL FOR ACTIVE MEMBERS
WITH 10 OR MORE YEARS OF SERVICE





Section IV – Demographic Assumptions

The rates of withdrawal adopted by the Board are used to determine the expected number of separations from active service, which will occur as a result of resignation or dismissal. As discussed in the executive summary, we have used a liability-weighted methodology to study this assumption. The numbers shown in the tables have been weighted by annual salary. The preceding results indicate that for male and female members with less than 5 years of service, the actual weighted withdrawal rates were greater than expected at older ages and less than expected at younger ages and overall.

In addition, the results show that for male and female members with greater than 5 years of service and less than 10 years of service, the actual weighted withdrawal rates show some variations by age category, but were fairly close to the expected rates overall, and for male and female members with greater than 10 years of service, the actual weighted withdrawal rates were less than expected at most ages and in total.

We have determined that the rates of withdrawal should be revised at this time to reflect the experience of the System.

The following table shows a comparison between the present withdrawal rates and the proposed rates.

COMPARATIVE RATES OF WITHDRAWAL FROM ACTIVE SERVICE

AGE	RATES OF WITHDRAWAL					
	PRESENT			PROPOSED		
	Years of Service			Years of Service		
	0 - 4	5 - 9	10+	0 - 4	5 - 9	10+
	Males					
20	11.00%			20.00%		
25	11.00%	3.00%		11.00%	3.25%	
30	11.00%	3.00%	3.00%	10.00%	3.60%	2.80%
35	12.00%	3.50%	1.40%	11.00%	3.60%	1.55%
40	12.00%	4.50%	1.40%	12.50%	4.00%	1.25%
45	12.00%	4.50%	1.30%	11.50%	4.00%	1.10%
50	14.00%	4.50%	1.90%	14.25%	4.50%	1.10%
55	15.00%	4.50%		15.00%	6.00%	
	Females					
20	9.00%			13.00%		
25	9.00%	4.00%		9.00%	4.50%	
30	12.00%	4.00%	1.65%	11.00%	4.25%	1.00%
35	12.00%	4.00%	1.50%	11.00%	3.50%	1.60%
40	12.00%	4.00%	1.30%	12.50%	4.00%	1.20%
45	13.00%	4.00%	1.20%	13.50%	4.00%	1.00%
50	13.00%	5.00%	1.50%	15.00%	4.50%	1.25%
55	15.00%	5.00%		15.00%	5.00%	

Section IV – Demographic Assumptions

The following table shows a comparison of the actual and expected withdrawals from active service based on the new proposed rates of withdrawal.

COMPARISON OF ACTUAL AND EXPECTED RATE OF WITHDRAWALS FROM ACTIVE SERVICE BASED ON PROPOSED RATES OF WITHDRAWAL

CENTRAL AGE OF GROUP	RATES OF WITHDRAWAL					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
	Withdrawals with less than 5 years of service					
20	0.263	0.200	1.315	0.155	0.127	1.220
25	0.100	0.108	0.926	0.085	0.091	0.934
30	0.088	0.100	0.880	0.095	0.104	0.913
35	0.100	0.110	0.909	0.105	0.110	0.955
40	0.134	0.125	1.072	0.124	0.122	1.016
45	0.110	0.115	0.957	0.135	0.133	1.015
50	0.144	0.142	1.014	0.163	0.150	1.087
53 & OVER	0.172	0.159	1.082	0.201	0.174	1.155
TOTAL	0.111	0.116	0.957	0.107	0.110	0.973
	Withdrawals with at least 5 but less than 10 years of service					
25	0.033	0.033	1.000	0.052	0.045	1.156
30	0.036	0.036	1.000	0.042	0.043	0.977
35	0.036	0.036	1.000	0.034	0.035	0.971
40	0.042	0.040	1.050	0.040	0.040	1.000
45	0.034	0.040	0.850	0.036	0.040	0.900
50	0.044	0.045	0.978	0.047	0.045	1.044
53 & OVER	0.075	0.060	1.250	0.057	0.054	1.056
TOTAL	0.040	0.039	1.026	0.040	0.041	0.976
	Withdrawals with 10 or more years of service					
30	0.032	0.028	1.143	0.009	0.010	0.900
35	0.016	0.016	1.000	0.017	0.016	1.063
40	0.013	0.012	1.083	0.012	0.012	1.000
45	0.010	0.011	0.909	0.009	0.010	0.900
50	0.010	0.011	0.909	0.012	0.013	0.923
53 & OVER	0.014	0.012	1.167	0.015	0.016	0.938
TOTAL	0.012	0.012	1.000	0.012	0.012	1.000

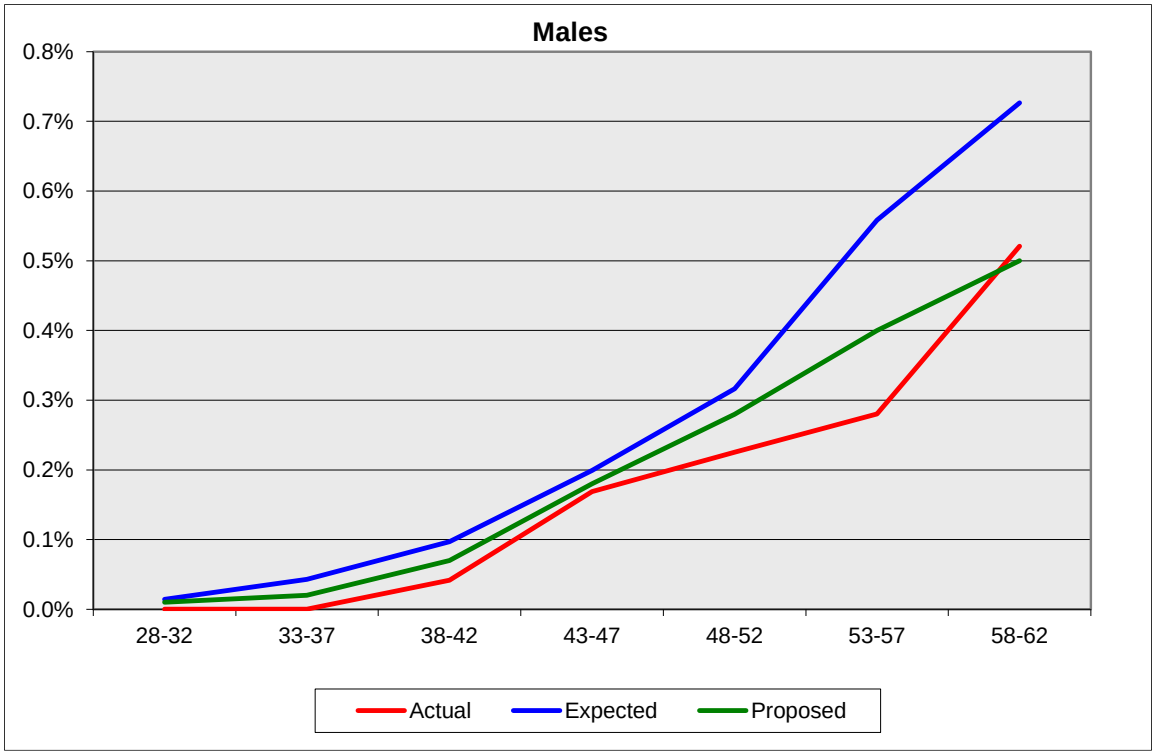
RATES OF DISABILITY RETIREMENT

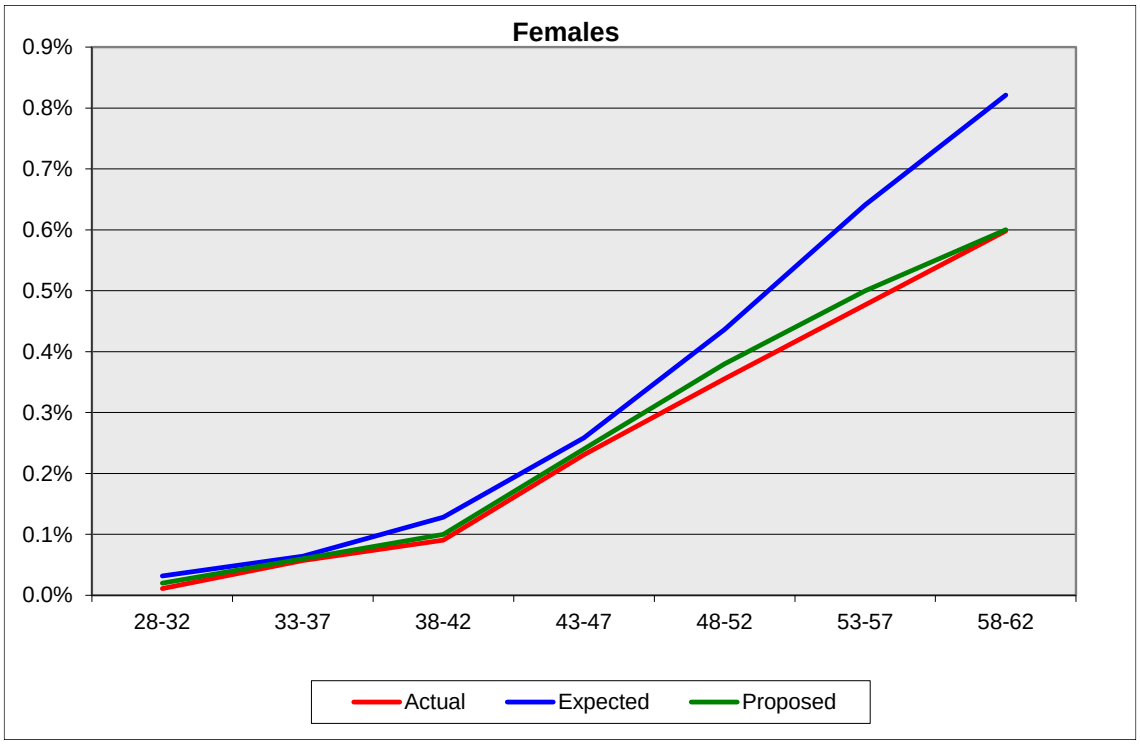
COMPARISON OF ACTUAL AND EXPECTED DISABILITY RETIREMENTS

CENTRAL AGE OF GROUP	NUMBER OF DISABILITY RETIREMENTS					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
25	0	0.4	0.000	0	2.2	0.000
30	0	1.2	0.000	3	8.8	0.341
35	0	4.7	0.000	19	21.4	0.888
40	5	11.7	0.427	32	45.4	0.705
45	21	24.8	0.847	85	95.2	0.893
50	24	33.7	0.712	118	144.8	0.815
55	21	41.8	0.502	103	138.4	0.744
60	23	32.1	0.717	73	100.3	0.728
63 & OVER	18	24.4	0.738	57	53.4	1.067
TOTAL	112	174.8	0.641	490	609.9	0.803

The following graphs show a comparison of the present, actual, and proposed rates of disability retirement.

RATES OF DISABILITY RETIREMENT





Section IV – Demographic Assumptions

The preceding results indicate that the actual number of disability retirements for both males and females was less than expected at most ages and in aggregate. We have determined that the rates of disability retirements should be revised to reflect more closely the actual experience of the membership.

The following table shows a comparison between the present and proposed rates of disability retirements.

COMPARATIVE RATES OF DISABILITY RETIREMENTS

AGE	RATES OF DISABILITY RETIREMENT			
	MALES		FEMALES	
	Present	Proposed	Present	Proposed
20	0.01%	0.01%	0.01%	0.01%
25	0.01%	0.01%	0.01%	0.01%
30	0.01%	0.01%	0.03%	0.02%
35	0.04%	0.02%	0.06%	0.06%
40	0.09%	0.07%	0.12%	0.10%
45	0.20%	0.18%	0.25%	0.24%
50	0.30%	0.28%	0.44%	0.38%
55	0.58%	0.40%	0.65%	0.50%
60	0.75%	0.50%	0.85%	0.60%

Section IV – Demographic Assumptions

The following table shows a comparison of the actual and expected disability retirements based on new proposed rates of disability.

COMPARISON OF ACTUAL AND EXPECTED DISABILITY RETIREMENTS BASED ON PROPOSED RATES OF DISABILITY

CENTRAL AGE OF GROUP	NUMBER OF DISABILITY RETIREMENTS					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
25	0	0.4	0.000	0	1.3	0.000
30	0	1.0	0.000	2	5.2	0.385
35	0	2.8	0.000	14	17.0	0.824
40	5	9.3	0.538	27	34.1	0.792
45	21	22.3	0.942	73	77.1	0.947
50	24	29.7	0.808	120	122.9	0.976
55	21	29.5	0.712	102	112.3	0.908
60	23	21.5	1.070	83	79.1	1.049
63 & OVER	18	16.2	1.111	69	51.4	1.342
TOTAL	112	132.7	0.844	490	500.4	0.979

RATES OF RETIREMENT

COMPARISON OF ACTUAL AND EXPECTED RETIREMENTS

MEMBERS WITH LESS THAN 27 YEARS OF SERVICE

CENTRAL AGE OF GROUP	NUMBER OF RETIREMENTS					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
55	51	46.8	1.090	141	160.2	0.880
56	48	41.7	1.151	211	148.6	1.420
57	45	41.0	1.098	172	135.7	1.268
58	50	36.0	1.389	165	127.3	1.296
59	40	34.5	1.159	168	127.4	1.319
60	83	83.1	0.999	302	283.6	1.065
61	93	74.8	1.243	351	239.7	1.464
62	73	76.1	0.959	230	194.7	1.181
63	95	62.3	1.525	245	176.6	1.387
64	57	60.6	0.941	174	138.5	1.256
65	62	67.2	0.923	182	167.9	1.084
66	64	54.0	1.185	173	134.4	1.287
67	67	44.6	1.502	130	74.5	1.745
68	42	31.2	1.346	83	49.3	1.684
69	35	23.4	1.496	58	36.5	1.589
SUBTOTAL	905	777.3	1.164	2,785	2,194.9	1.269
70 & OVER	98	117.2	0.836	174	196.8	0.884
TOTAL	1,003	894.5	1.121	2,959	2,391.7	1.237
Average Retirement Age	63.1	63.5	0.994	62.0	62.3	0.995

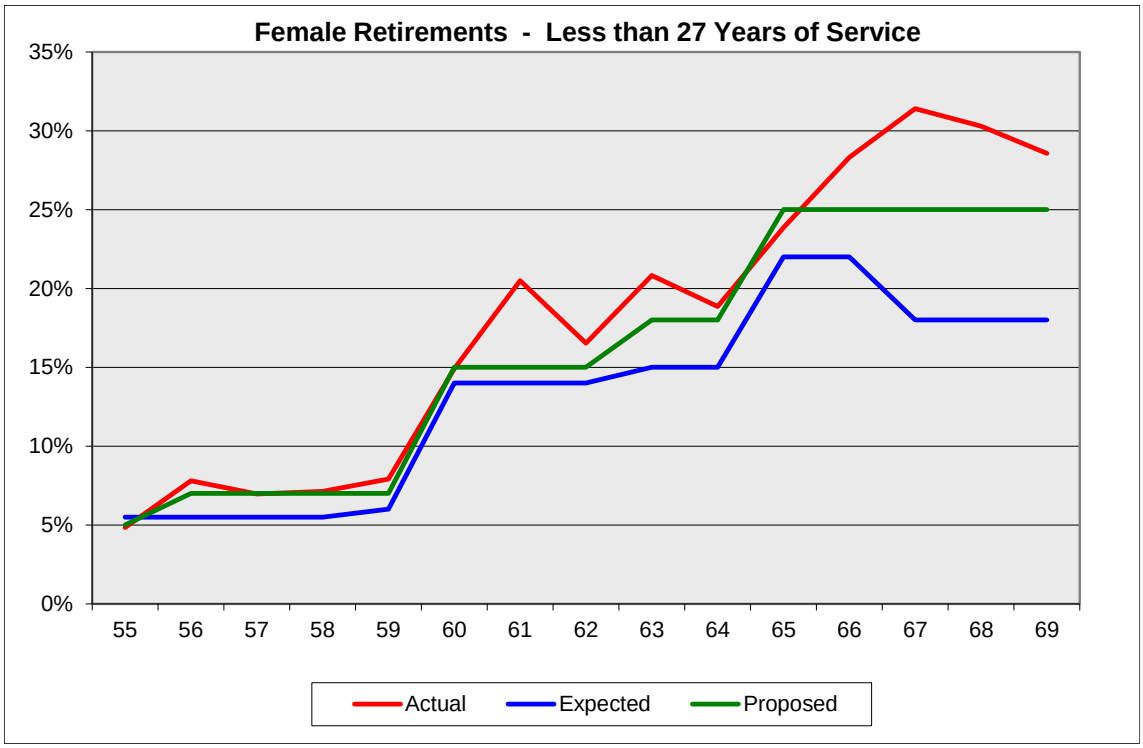
COMPARISON OF ACTUAL AND EXPECTED RETIREMENTS

MEMBERS WITH 27 OR MORE YEARS OF SERVICE

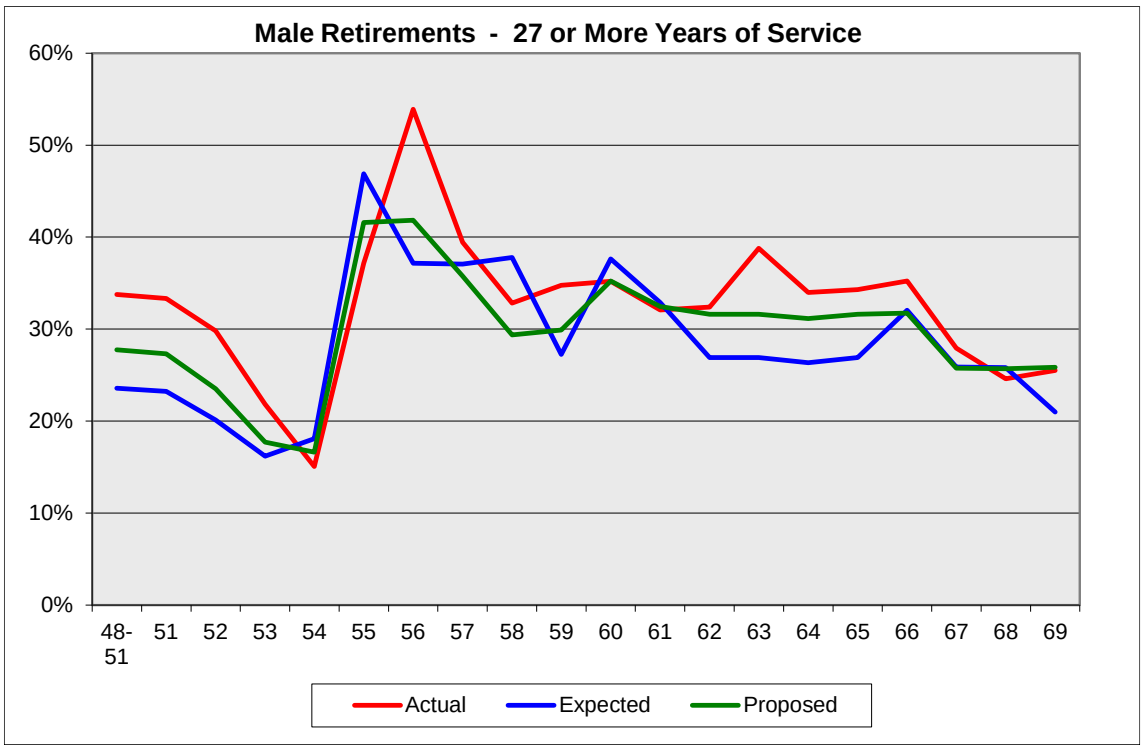
CENTRAL AGE OF GROUP	NUMBER OF RETIREMENTS					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
52 & Under	285	197.6	1.442	1,025	839.1	1.222
53	79	58.6	1.348	261	247.1	1.056
54	58	69.7	0.832	198	232.4	0.852
55	146	184.3	0.792	623	641.6	0.971
56	186	128.3	1.450	471	386.7	1.218
57	86	80.8	1.064	225	223.1	1.009
58	66	76.0	0.868	191	182.6	1.046
59	65	51.0	1.275	169	165.5	1.021
60	63	67.4	0.935	180	164.9	1.092
61	51	52.3	0.975	157	146.9	1.069
62	46	38.2	1.204	134	129.3	1.036
63	45	31.2	1.442	119	113.9	1.045
64	35	27.2	1.287	81	84.2	0.962
65	36	28.3	1.272	86	66.6	1.291
66	31	28.2	1.099	64	49.0	1.306
67	19	17.6	1.080	51	39.7	1.285
68	15	15.8	0.949	28	29.9	0.936
69	13	10.7	1.215	31	27.8	1.115
SUBTOTAL	1,325	1,163.2	1.139	4,094	3,770.3	1.086
70 & OVER	66	67.0	0.985	80	101.0	0.792
TOTAL	1,391	1,230.2	1.131	4,174	3,871.3	1.078
Average Retirement Age	57.5	58.0	0.991	56.4	56.7	0.995

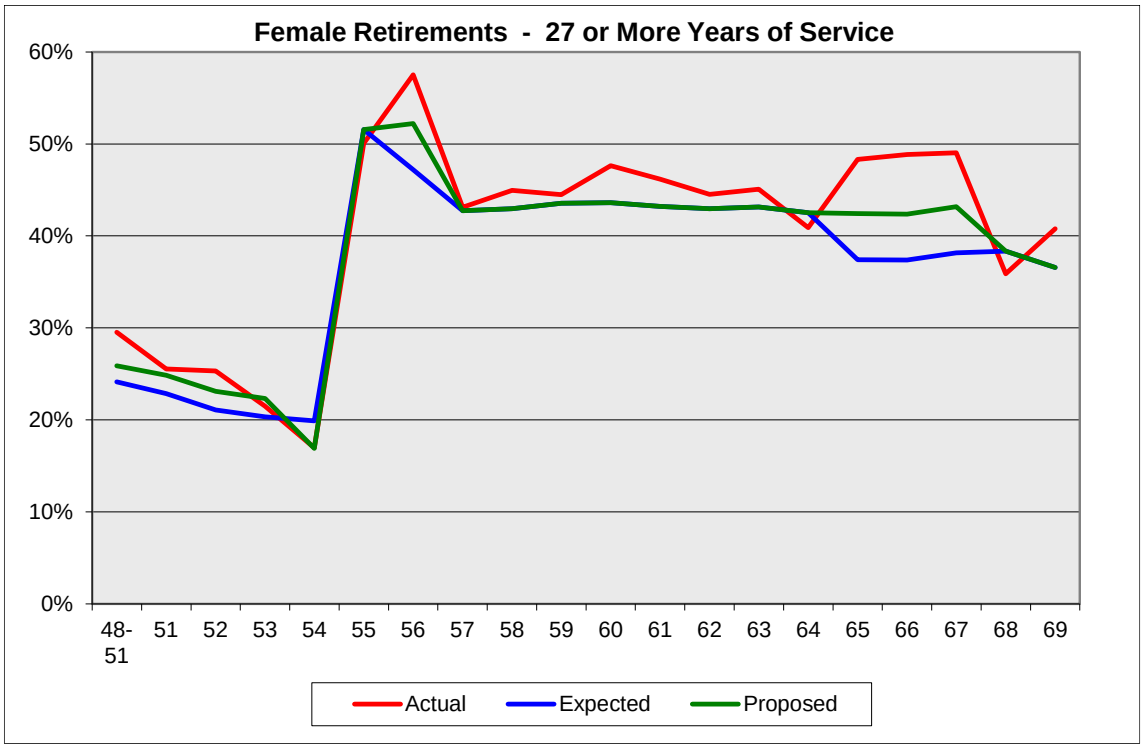
The following graphs show a comparison of the present, actual, and proposed rates of service retirements.

RATES OF RETIREMENT



RATES OF RETIREMENT





Section IV – Demographic Assumptions

The preceding results indicates that in most age categories and overall, the actual rates of retirement for members with less than 27 years of service for both males and females were greater than expected.

For members with 27 or more years of service, the actual rates of retirement were greater than expected at most ages and overall. On the basis of this experience, we have determined that the rates of retirement need revision in order to reflect actual experience more closely. The following table shows a comparison of the present and proposed rates of service retirement.

COMPARATIVE RATES OF RETIREMENT

AGE	RATES OF RETIREMENT							
	MALES				FEMALES			
	Present Less than 27 Years of Service	Present* 27 or More Years of Service	Proposed Less than 27 Years of Service	Proposed** 27 or More Years of Service	Present Less than 27 Years of Service	Present* 27 or More Years of Service	Proposed Less than 27 Years of Service	Proposed*** 27 or More Years of Service
48	0.00%	17.00%	0.00%	17.00%	0.00%	15.00%	0.00%	17.00%
49	0.00%	17.00%	0.00%	17.00%	0.00%	17.00%	0.00%	17.00%
50	0.00%	17.00%	0.00%	25.00%	0.00%	18.00%	0.00%	20.00%
51	0.00%	17.00%	0.00%	22.00%	0.00%	18.00%	0.00%	20.00%
52	0.00%	16.00%	0.00%	20.00%	0.00%	18.00%	0.00%	20.00%
53	0.00%	13.00%	0.00%	15.00%	0.00%	18.00%	0.00%	20.00%
54	0.00%	15.00%	0.00%	14.00%	0.00%	18.00%	0.00%	15.00%
55	5.00%	45.00%	5.25%	40.00%	5.50%	50.00%	5.00%	50.00%
56	5.00%	35.00%	5.25%	40.00%	5.50%	45.00%	7.00%	50.00%
57	5.50%	35.00%	6.25%	34.00%	5.50%	40.00%	7.00%	40.00%
58	5.50%	35.00%	6.25%	27.00%	5.50%	40.00%	7.00%	40.00%
59	5.50%	25.00%	6.25%	28.00%	6.00%	40.00%	7.00%	40.00%
60	13.00%	35.00%	13.50%	33.00%	14.00%	40.00%	15.00%	40.00%
61	13.00%	30.00%	15.00%	30.00%	14.00%	40.00%	15.00%	40.00%
62	15.00%	25.00%	15.00%	30.00%	14.00%	40.00%	15.00%	40.00%
63	13.00%	25.00%	15.00%	30.00%	15.00%	40.00%	18.00%	40.00%
64	15.00%	25.00%	15.00%	30.00%	15.00%	40.00%	18.00%	40.00%
65	20.00%	25.00%	20.00%	30.00%	22.00%	35.00%	25.00%	40.00%
66	20.00%	30.00%	22.00%	30.00%	22.00%	35.00%	25.00%	40.00%
67	20.00%	25.00%	25.00%	25.00%	18.00%	35.00%	25.00%	40.00%
68	20.00%	25.00%	25.00%	25.00%	18.00%	35.00%	25.00%	35.00%
69	20.00%	20.00%	25.00%	25.00%	18.00%	35.00%	25.00%	35.00%
70	20.00%	20.00%	25.00%	30.00%	20.00%	35.00%	30.00%	35.00%
71	20.00%	20.00%	25.00%	30.00%	20.00%	35.00%	30.00%	35.00%
72	20.00%	20.00%	25.00%	30.00%	20.00%	35.00%	30.00%	35.00%
73	20.00%	20.00%	25.00%	30.00%	20.00%	35.00%	30.00%	35.00%
74	20.00%	20.00%	25.00%	30.00%	20.00%	35.00%	30.00%	35.00%
75	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

* Plus 7.5% in year when first eligible for unreduced retirement with 27 years of service.
** Plus 8.5% in year when first eligible for unreduced retirement with 27 years of service.
*** Plus 10.0% in year when first eligible for unreduced retirement with 27 years of service.

Section IV – Demographic Assumptions

The following table shows a comparison of actual and expected service retirements based on new proposed rates of retirement.

COMPARISON OF ACTUAL AND EXPECTED RETIREMENTS BASED ON PROPOSED RETIREMENT RATES

MEMBERS WITH LESS THAN 27 YEARS OF SERVICE

CENTRAL AGE OF GROUP	NUMBER OF RETIREMENTS					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
55	51	49.1	1.039	141	145.6	0.968
56	48	43.7	1.098	211	189.1	1.116
57	45	46.6	0.966	172	172.8	0.995
58	50	40.9	1.222	165	162.1	1.018
59	40	39.2	1.020	168	148.6	1.131
60	83	86.3	0.962	302	303.9	0.994
61	93	86.3	1.078	351	256.8	1.367
62	73	76.1	0.959	230	208.7	1.102
63	95	71.9	1.321	245	211.9	1.156
64	57	60.6	0.941	174	166.1	1.048
65	62	67.2	0.923	182	190.8	0.954
66	64	59.4	1.077	173	152.8	1.132
67	67	55.8	1.201	130	103.5	1.256
68	42	39.0	1.077	83	68.5	1.212
69	35	29.3	1.195	58	50.8	1.142
SUBTOTAL	905	851.4	1.063	2,785	2,532.0	1.100
70 & OVER	98	131.0	0.748	174	237.7	0.732
TOTAL	1,003	982.4	1.021	2,959	2,769.7	1.068
Average Retirement Age	63.1	63.6	0.992	62.0	62.4	0.994

COMPARISON OF ACTUAL AND EXPECTED RETIREMENTS BASED ON PROPOSED RETIREMENT RATES

MEMBERS WITH 27 YEARS OF SERVICE AND MORE

CENTRAL AGE OF GROUP	NUMBER OF RETIREMENTS					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
52 & Under	285	231.4	1.232	1,025	906.0	1.131
53	79	64.1	1.232	261	271.4	0.962
54	58	64.0	0.906	198	197.4	1.003
55	146	163.5	0.893	623	641.6	0.971
56	186	144.4	1.288	471	427.6	1.101
57	86	77.9	1.104	225	223.1	1.009
58	66	59.0	1.119	191	182.6	1.046
59	65	55.9	1.163	169	165.5	1.021
60	63	63.1	0.998	180	164.9	1.092
61	51	51.6	0.988	157	146.9	1.069
62	46	44.9	1.024	134	129.3	1.036
63	45	36.7	1.226	119	113.9	1.045
64	35	32.1	1.090	81	84.2	0.962
65	36	33.2	1.084	86	75.5	1.139
66	31	27.9	1.111	64	55.5	1.153
67	19	17.5	1.086	51	44.9	1.136
68	15	15.7	0.955	28	29.9	0.936
69	13	13.2	0.985	31	27.8	1.115
SUBTOTAL	1,325	1,196.1	1.108	4,094	3,888.0	1.053
70 & OVER	66	80.0	0.825	80	101.0	0.792
TOTAL	1,391	1,276.1	1.090	4,174	3,989.0	1.046
Average Retirement Age	57.5	58.0	0.991	56.4	56.6	0.996

Section IV – Demographic Assumptions

RATES OF MORTALITY

Mortality tables are a fundamental assumption in actuarial valuations. Benefits are paid over a retiree's lifetime, so it is important to appropriately reflect what a typical lifetime is expected to be. In addition, deaths before retirement typically result in the payout of benefits to a spouse or survivor. For this review, we considered the following mortality:

- Post-retirement – project the percentage of healthy participants in pay status expected to die each year
- Contingent Annuitant – project the percentage of spouses or survivors in pay status expected to die each year
- Pre-retirement – project the percentage of active employees expected to die each year
- Disabled – project the percentage of disabled retirees expected to die each year

Method

The issue of future mortality improvement is one that the actuarial profession has become increasingly focused on studying in recent years. This has resulted in changes to the relevant Actuarial Standard of Practice, ASOP 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations. This ASOP requires the pension actuary to make and disclose a specific recommendation with respect to future improvements in mortality after the valuation date. There have been significant improvements in longevity in the past, although there are different opinions about future expectations. We believe it is prudent to anticipate that the trend will continue to some degree in the future. Therefore, we believe it is appropriate to reflect future mortality improvement as part of the mortality assumption.

There are two widely used approaches for reflecting future improvements in mortality:
(1) Static table with "margin"
(2) Generational mortality

The first approach to reflecting mortality improvements is with the use of a static mortality table with "margin." Under this approach, the A/E ratio is intentionally targeted to be over 100% so that mortality can improve without creating actuarial losses. While there is no formal guidance as to the amount of margin required (how far above 100% is appropriate for the A/E ratio), we typically prefer to have a margin of around 10 to 14% at the core ages of the retired member. The goal is still for the general shape of the curve to be a reasonable fit to the observed experience. Depending on the magnitude and duration of actual mortality improvements in the future, the margin may decrease and eventually become insufficient. If that occurs, the assumption will need to be updated.

Another approach, referred to as generational mortality, directly anticipates future improvements in mortality by using a different set of mortality rates for each year of birth, with the rates for later years of birth assuming lower mortality than the rates for earlier years of birth. The varying mortality rates by year of birth create a series of tables that contain "built-in" mortality improvements, e.g., a member who turns age 65 in 2035 has a longer life expectancy than a member who turns age 65 in 2020. When using generational mortality, the A/E ratios for the observed experience are set near 100% since future mortality improvements will be taken into account directly in the actuarial valuation process.

For the mortality decrements, we also analyzed the experience using a liability-weighted approach (also referred to as benefit-weighted). This is approximated by using the member's retirement benefit from the data collected. The exposure and actual occurrences are then multiplied by the benefit level to provide the liability-weighted experience. This approach is particularly insightful when analyzing experience from a non-homogenous group. While we reviewed the mortality experience on both a count and liability-weighted basis, we ultimately decided on the liability-weighted results to evaluate experience and develop a new mortality table.

The current post-retirement mortality assumption for healthy lives is a static table, the RP-2000 Combined Mortality Table projected to 2025 with projection scale BB and set forward 2 years for males and set forward 1 year for females. The results of the experience analysis indicate that this table provided a reasonable expectation of mortality for the past five years but there were consistent mortality losses in each of the last five valuations.

While prior pension mortality tables have been based solely on private corporate and union retirement plans, new tables, released in late 2018, are based entirely on public sector plan data. These new tables are referred to the Pub-2010 Public Mortality Plan Mortality Tables. These tables are split by three membership types: Safety, Teachers, and General to reflect the observed differences in mortality patterns related to the three groups. Tables are further split for healthy retirees, disabled retirees, contingent beneficiaries, and employees. There are still other breakdowns in these tables for at, above or below median annuity values. We anticipate that this family of tables will be a good starting point in developing a mortality assumption.

Section IV – Demographic Assumptions

The following steps used to set a new mortality table are as follows:

1) Selecting a mortality table based on standard mortality tables published by the Society of Actuaries adjusted using various techniques to provide a better fit to the actual mortality experience, but with no adjustment for expected future mortality improvements. The mortality table selected is determined on a benefit-weighted basis. This means that the ages at death for retirees with larger benefits are weighted more than the ages at death for retirees with smaller benefits. Using this weighting resulted in selecting tables with longer life expectancies than tables that would have been selected based on a head-count weighted basis.

2) Applying a "mortality projection" scale which is an explicit assumption that future generations live longer than current generations. Beginning in 2014, the SOA has released an updated mortality improvement scale every year. We are proposing using the most recently released scale, MP-2020, adjusted to 75% of the standard rates. This adjustment results in improvements that are less than those suggested by the MP-2020 scale. We have suggested this adjustment because each year since 2014 the SOA has scaled back the amount of mortality improvement in subsequent mortality projection scales.

Generational mortality tables tend to reflect actual life expectancies of plan members more accurately and since future mortality improvements are built into the tables future updates to the tables tend to be on a smaller scale.

Experience

This Section summarizes the post-retirement, pre-retirement, disabled, and contingent annuitant mortality experience of the study period. The charts below summarize the experience by showing the ratio of the actual number of benefits released during the study period over the expected number of benefits released over the study period, compiled separately for males and females. In these charts, a ratio greater/(less) than 100% indicates that there were more/(fewer) benefits released than expected by the current assumption.

Post-retirement and contingent annuitant mortality have the most significant impact on mortality experience in the plans.

Section IV – Demographic Assumptions

The healthy service retiree's post-retirement mortality gains and losses over the study period are as follows and are consistent with our analysis of actual to expected:

POST-RETIREMENT MORTALITY GAIN/(LOSS)						
(In millions)	2016	2017	2018	2019	2020	Total Gain/(Loss)
TRS	(71.1)	(45.2)	(58.8)	(51.4)	(73.9)	(300.4)

POST-RETIREMENT MORTALITY				
	MALES		FEMALES	
	Ratio of actual to expected	Ratio of actual to proposed	Ratio of actual to expected	Ratio of actual to proposed
TRS	0.902	0.981	0.824	0.971

We would have anticipated experience gains over the study period due to using a static table with margin approach. However, experience indicates that the current post-retirement mortality assumption primarily produced losses during the study period.

Section IV – Demographic Assumptions

The contingent annuitant's post-retirement mortality gains and losses over the study period are as follows and are consistent with our analysis of actual to expected:

CONTINGENT ANNUITANT MORTALITY GAIN/(LOSS)						
(In millions)	2016	2017	2018	2019	2020	Total Gain/(Loss)
TRS	0.0	(2.8)	1.3	(6.9)	(5.6)	(14.0)

CONTINGENT ANNUITANT MORTALITY				
	MALES		FEMALES	
	Ratio of actual to expected	Ratio of actual to proposed	Ratio of actual to expected	Ratio of actual to proposed
TRS	1.284	1.011	0.931	0.993

In the past, the same mortality assumption used for post-retirement service retiree's mortality was also used for contingent annuitants. A new feature of the Pub-2010 tables is a contingent annuitant specific table. We propose using these tables for contingent annuitants. In most cases, we have made assumptions that tie closely to the actual experience, but the data is not sufficient enough to be expected to closely predict mortality rates in the future for this group.

Section IV – Demographic Assumptions

Charts summarizing the pre-retirement and disabled mortality are as follows:

PRE-RETIREMENT MORTALITY				
	MALES		FEMALES	
	Ratio of actual to expected	Ratio of actual to proposed	Ratio of actual to expected	Ratio of actual to proposed
TRS	0.880	0.990	0.874	0.989

DISABLED MORTALITY				
	MALES		FEMALES	
	Ratio of actual to expected	Ratio of actual to proposed	Ratio of actual to expected	Ratio of actual to proposed
TRS	0.792	0.985	0.558	0.978

As is typical with most large public pension plans, a small number of pre-retirement and disability deaths occur, and thus a small amount of liability is released for the active and disabled member populations during the experience period. We are changing the base tables to the Pub-2010 employee and disabled tables respectively and have applied minimal adjustments to better fit the experience. In most cases we have made assumptions that tie more closely to the actual experience, but the data is not sufficient enough to be expected to closely predict mortality rates in the future for these groups.

Section IV – Demographic Assumptions

Determination

We have determined that TRS should change to a Generational Mortality approach on a benefit-weighted basis.

We are also updating the base mortality table from RP 2014 to the Pub-2010 tables for teachers which is the latest table produced by the Society of Actuaries and adjusting this new base table to better match the experience of TRS.

Finally, we are implementing the MP-2020 mortality improvement scale adjusted to 75% of the standard rates.

Below is a summary of the specific mortality tables and adjustments for each of the groups:

Group	Membership Table	Set Forward (+)/ Setback (-)	Adjustment to Rates	Projection Scale
Service Retirees	Teachers Benefit-Weighted	Male: +2 Female: +2	Male: 102%, Female: 98%	75% of MP-2020
Contingent Annuitants	Teachers Benefit-Weighted	Male: +2 Female: None	Male: 101%, Female: 100%	75% of MP-2020
Disabled Retirees	Teachers Benefit-Weighted	Male: +1 Female: -2	Male: 96%, Female: 94%	75% of MP-2020
Actives	Teachers Benefit-Weighted	Male: +1 Female: -2	Male: 100%, Female: 98%	75% of MP-2020

Section IV – Demographic Assumptions

RATES OF SALARY INCREASE

Estimates of future salaries for each member are based on assumptions for two types of increases:

- Increases in each individual's salary due to promotion or longevity (often called merit scale), and
- Increases in the general wage increase of the membership, which is directly related to price and wage inflation.

Earlier in this report, we determined that the wage inflation assumption be set at 2.75% (2.50% price inflation and 0.25% real wage growth). Therefore, the merit scale will be added to the applicable wage inflation assumption to develop the total individual salary increase assumption.

Analysis of the merit salary scale is complicated by the fact that only total salary is reported to TRS, which includes both the general wage inflation component of salary increases and the merit salary scale. Furthermore, there is often a delay in actual price inflation compared to when it has an impact on salary increases. As a result, it is difficult to isolate the merit scale for purposes of measuring the actual salary experience. One technique we used to help reduce the effect of inflation was to look at the individual salary increases for each of the five years in the study period and adjust the results so that the longer service individuals had increases of approximately 3.00%. This allows us to focus on the shape of the increases and determine the reasonableness of a possible salary merit scale. In addition, salary increases for governmental employees during this study period have been lower than those observed in corporate America. Consequently, the selection of a merit scale has a significant component of professional judgment.

Lastly, the current rates of salary increase for active members are based on the member's age. We have studied rates of salary increase for many statewide plans over the past five years and determined that rates of salary increase for active members are better correlated to the member's service, rather than age. Therefore, we have determined that TRS should change to a service-based table for rates of salary increase for active members.

COMPARISON OF ACTUAL AND EXPECTED SALARIES OF ACTIVE MEMBERS

CENTRAL AGE OF GROUP	RATES OF SALARY INCREASE		
	CURRENT RATES		
	Actual	Expected	Ratio of Actual to Expected
25	11.78%	6.31%	1.867
30	5.61%	5.46%	1.027
35	4.77%	4.75%	1.004
40	3.91%	4.27%	0.916
45	3.08%	3.91%	0.787
50	2.92%	3.72%	0.786
55	3.39%	3.54%	0.958
58+	3.80%	3.50%	1.086
TOTAL	4.17%	4.24%	0.984

During the period under investigation, the actual rates of salary increase were lower than expected in aggregate but as you can see from the table above, the correlation between salary increases and age is not consistent. The following table uses the same data but is shown using service as the basis. There is slightly better correlation between salary growth and service bands.

SERVICE OF GROUP	RATES OF SALARY INCREASE		
	CURRENT RATES		
	Actual	Expected	Ratio of Actual to Expected
1	14.51%	5.47%	2.652
2	5.22%	5.32%	0.981
3	4.44%	5.18%	0.856
4	6.42%	5.03%	1.276
5	4.92%	4.90%	1.004
6-9	4.02%	4.57%	0.880
10-19	2.83%	4.02%	0.703
20-29	2.89%	3.67%	0.786
TOTAL	4.17%	4.24%	0.984

Section IV – Demographic Assumptions

The rates of salary increase consist of wage inflation and a scale for merit and promotion. We determined in the Economic section of this report that the wage inflation assumption should be reduced by 0.75% from 3.50% to 2.75%. The following table is the proposed merit salary scale based on actual experience.

CENTRAL SERVICE OF GROUP	RATES OF SALARY INCREASE		
	PROPOSED RATES		
	Proposed Rate of Increase	Less Expected Wage Inflation	Proposed Merit Scale
1	7.50%	2.75%	4.75%
2	5.50%	2.75%	2.75%
3	5.00%	2.75%	2.25%
4	5.00%	2.75%	2.25%
5	5.00%	2.75%	2.25%
6-9	4.25%	2.75%	1.50%
10-19	3.25%	2.75%	0.50%
20-29	3.00%	2.75%	0.25%
30+	3.00%	2.75%	0.25%

Section V – Assumptions Specific to the Health Trust and Life Trust

Long-Term Rate of Return

Past Experience

One of the inherent problems with analyzing historical data is that the results can look significantly different depending on the timeframe used, especially if the year-to-year results vary widely. In addition, the asset allocation can also impact the investment returns so comparing results over long periods when different asset allocations were in place may not be meaningful.

The assets for TRS are valued using a widely accepted asset-smoothing methodology that fully recognizes the expected investment income and also recognizes 20% of each year's investment gain or loss (the difference between actual and expected investment income). The recent experience over the last five years is shown in the table below for the Health Trust and Life Trust.

Year Ending 6/30	Health Trust		Life Trust	
	Actuarial Value	Market Value	Actuarial Value	Market Value
2016	5.9%	-1.4%	3.8%	5.5%
2017	6.6%	11.9%	2.7%	1.0%
2018	6.9%	8.7%	2.7%	1.3%
2019	6.2%	6.1%	2.7%	6.5%
2020	5.8%	2.3%	3.6%	6.3%
Average	6.3%	5.5%	3.1%	4.1%

While important to review and analyze, historical returns over such a short time period are not credible for the purpose of setting the long-term assumed future rate of return.

Determination

As the Health Trust and Life Trust showed similar long-term projections to the Retirement Trust, and because the asset allocation strategy for the Health Trust will be impacted by the lower cash flows due to the State not paying their portion of the shared responsibility contributions, we have determined that there should be a decrease in the long-term expected return on assets assumption from 8.00% (Health Trust) and 7.50% (Life Trust) to 7.10% as shown in the chart on the following page.

Section V – Assumptions Specific to the Health Trust and Life Trust

	Investment Return Assumption		
	Current Health Trust	Current Life Trust	Proposed For Both
Real Rate of Return*	5.00%	4.50%	4.60%
Inflation	3.00	3.00	2.50
Net Investment Return	8.00%	7.50%	7.10%

* Net of investment expenses.

Health Care Cost Trend Rates

Background: In addition to the economic assumptions used in all of the actuarial valuations performed for the Teachers' Retirement System of the State of Kentucky (System), the health care cost trend rates reflect the change in per capita health claims rates over time due to the following factors:

- medical inflation
- utilization
- plan design
- technology improvements

For the Health Insurance Trust (Health Trust), health care cost trend rates are needed to project the future cost of providing benefits of the Health Trust, including Kentucky Employees' Health Plan (KEHP) premiums, Medicare Eligible Health Plan (MEHP) costs, and Shared Responsibility contributions based upon Medicare Part B premiums.

The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 6, *"Measuring Retiree Group Benefit Obligations,"* which provides guidance to actuaries in selecting economic assumptions for measuring obligations of post-retirement plans other than pensions. The actuary should not consider aging of the covered population when selecting the trend assumption for projecting future costs, but should consider the following key components in setting the health care cost trend rate as noted in ASOP No. 6:

- inflation
- medical inflation
- definition of covered charges
- frequency of services
- leveraging caused by plan design features not explicitly modeled
- plan participation

Section V – Assumptions Specific to the Health Trust and Life Trust

When setting assumptions for projecting medical and prescription drug costs, Cavanaugh Macdonald Consulting, LLC (CMC) assumes the health benefit plan cost trend rates will decrease from an initial rate to an ultimate level. CMC's methodology for setting the initial trend rate includes the use of published annual health care inflation surveys in conjunction with actual plan experience, where credible. The initial trend rate assumption is subject to continued update and review with each valuation performed given the volatile nature of medical and prescription drug costs. There are various approaches used to determine the timing and level of decreases to the ultimate trend rate. The assumed decrease in medical and prescription drug trend rates reflects the belief that health care inflation cannot indefinitely outstrip the growth rate of employer budgets and the overall economy. As a standard of practice, CMC typically assumes a grading period of five to ten years, depending on the level of change (i.e., larger differences between the initial trend rate and the ultimate trend rate are assumed to require a longer reduction period). For the ultimate trend assumption, CMC looks to the "Long-Term Projection Assumptions for Medicare and Aggregate National Health Expenditures" published by Center for Medicare and Medicaid Services on April 22, 2020, which states that:

> "One way of analyzing health spending trends is to compare the growth rate of the U.S. health sector with that of the overall economy. Using a definition of "excess cost growth" as the difference between (I) the U.S. per capita growth rate in health-care costs adjusted for demographic factors and (ii) the per capita growth rate in GDP (both in constant dollars), Table 1 shows average excess cost growth rates for selected time periods since 1975. Average excess cost growth rates for national health expenditures (NHE) exhibit some volatility depending on which time periods are used for defining averages, but over the long run this differential has for extended periods been above 2 percent per year or just slightly below this level."

As a standard of practice, CMC believes the use of a "GDP+1.5%" to "GDP+2.5%" assumption is reasonable and CMC typically assumes an ultimate trend rate of price inflation +2.0%. As with any standard of practice, the specifics of each plan are reviewed to ensure there is nothing unusual that would necessitate a long-term trend rate that is either higher or lower than what is typical. It appears to be reasonable to use an ultimate rate of 4.50%, as there appears to be nothing unusual about the Kentucky Employees' Health Plan and Medicare Eligible Health Plan that would necessitate a long-term trend that is either higher or lower than what is typically used for this type of calculation.

Section V – Assumptions Specific to the Health Trust and Life Trust

In projecting the offsets associated with the Federal Supplementary Medical Insurance Trust Fund (Medicare Part B Premiums), projected trends from the CMS actuary in the most recent annual report to the trustees appear to provide a reasonable basis for the projection of these costs. As a standard of practice, CMC typically develops the trend assumptions for these benefits based upon the CMS actuary's most recent estimates.

In our opinion, the economic assumptions determined in this report have been developed in accordance with ASOP No. 6. Currently, the short-term health care trend rates are set on an annual basis based on the information and data as previously described, with an ultimate trend rate of price inflation plus excess cost growth that is reached after an appropriate grading period.

Determination: In our opinion, the health care cost trend rates determined in each year's valuation report are developed in accordance with ASOP No. 6. We will continue to update and review the initial rates with each year's valuation. Use an ultimate trend rate of price inflation + 2.0%, or 4.50%.

We are not making any specific assumption changes attributable to the COVID-19 pandemic at this time due to the level of uncertainty regarding the impact on plan costs going forward. Given the uncertainty regarding COVID-19 (e.g., the impact of routine care being deferred, direct COVID-19 treatment and prevention costs, changes in contribution and budget projections), continued monitoring of the impact on the Plan's liability will be required and changes, if necessary, will be made annually at the time that experience develops.

Section V – Assumptions Specific to the Health Trust and Life Trust

Morbidity

Background: The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 6, "Measuring Retiree Group Benefit Obligations", which provides guidance to actuaries when developing benefit cost projection assumptions for measuring obligations of postretirement plans other than pensions. As noted in ASOP No. 6, the actuary should consider the variation in rates by age for the benefits being modeled and use appropriate age bands if the rates vary significantly. The age bands should not be overly broad, based on the expected rate variations within the bands. If rates vary significantly by age, it is inappropriate to assume a single per capita rate that does not vary by age. The relationship between the rates at various ages is an actuarial assumption that may be based on normative databases.

Determination: CMC assumes the projected medical and prescription drug costs of MEHP vary significantly by age from the average cost at the central age of the applicable group based upon the paper "Aging Curves for Health Care Costs in Retirements", The North American Actuarial Journal, July 2005, Jeffrey P. Petertil. Here, the paper's "Representative Curve for General Use" is used for ages 50 and older, and factors developed from a national average claims and utilization database are used for ages below 50. CMC continuously monitors all available data, publications, and research projects undertaken by actuarial organizations regarding age-related morbidity (e.g., "Health Care Costs—From Birth to Death", Health Care Cost Institute's Independent Report Series – Report 2013-1, June 2013, Dale H. Yamamoto) and see no indication of the factors no longer being appropriate.

For the retiree health care liabilities of those under age 65, the current premium charged by the Kentucky Employees' Health Plan (KEHP) is used as the base cost and is projected forward using the health care trend assumption (i.e., no implicit rate subsidy is calculated or recognized). Under Actuarial Standard of Practice No. 6 (ASOP No. 6), aging subsidies (or implicit rate subsidies) should be recognized, as the differences in health care utilization and cost due to age have been demonstrated and well quantified. The impact of aging on a valuation's results can be as significant as the use of mortality, trend, and discounting. It has been the long-standing position that the responsibility for compliance with GASB Statement No. 43, when it relates to KEHP implicit subsidies, rests with KEHP, not the System, as the System has no operational authority over KEHP. As such, KEHP implicit subsidies are excluded from the OPEB funding valuation process of the Health Trust. As GASB 74 and 75 prohibit such a deviation from ASOP No. 6, KEHP implicit rate subsidies are included in the GASB Total OPEB Liability (TOL).

Section V – Assumptions Specific to the Health Trust and Life Trust

Coverage Assumptions

In addition to covering eligible retirees, many plans cover the spouse and dependents of retirees. In addition, plans may offer some or all participants a choice of coverage such as HMOs, PPOs, and POS plans. The magnitude of the retiree group benefit obligation can vary significantly as a result of the coverage assumptions. The actuary should therefore consider historical participation rates and trends in coverage rates when selecting the coverage assumptions.

Member Participation

Background: For plans that require some form of contribution to maintain coverage, some eligible inactive members may not elect to be covered, particularly if they have other coverage available from their most recent employer. Empirical data on plan participation, where available and credible, should be considered when selecting the participation assumption for future covered retirees that retire from an eligible inactive status. When developing the participation rates, how plan eligibility rules, plan choices, or retiree contribution rates have changed over time should be considered.

Furthermore, plan participation may be different in the future due to participants' response to changes in retiree contribution levels and plan choices. For plans that anticipate changes in retiree contributions, the appropriateness of participation rates that vary over the projection period for both current and future retirees should be considered. In addition, plan eligibility rules governing dropping coverage and subsequent re-enrollment when selecting participation rates should be considered.

Section V – Assumptions Specific to the Health Trust and Life Trust

Determination: Historical Health Trust participation levels suggest an adjustment to the current assumption. The use of the historical average is proposed, with adjustments to reflect an increase in participation as the System's contribution Benefits increases.

TRS	Valuation Date						
Contribution %	6/30/2015	6/30/2016	6/30/2017	6/30/2018	6/30/2019	6/30/2020	Average
Number of Retirees Electing Medical Insurance Coverage							
10%	63	70	63	53	54	50	59
25%	250	278	329	352	388	407	334
45%	7	2	4	26	49	80	28
50%	712	717	709	689	688	699	702
65%	4	0	1	1	0	0	1
75%	1,297	1,404	1,523	1,611	1,665	1,687	1,531
90%	506	470	441	394	359	314	414
95%	0	0	0	0	0	0	0
100%	34,701	35,383	35,981	36,710	37,135	37,594	36,251
Number of Retirees Eligible for Medical Insurance Coverage							
10%	392	427	450	459	491	521	457
25%	1,514	1,685	1,819	1,939	2,059	2,168	1,864
45%	30	4	20	65	141	233	82
50%	1,767	1,831	1,834	1,805	1,806	1,834	1,813
65%	10	0	14	30	50	72	29
75%	2,000	2,223	2,395	2,526	2,601	2,666	2,402
90%	632	595	558	503	464	418	528
95%	0	0	1	2	2	5	2
100%	37,419	38,439	39,342	40,283	41,037	41,770	39,715
% Electing Medical Insurance Coverage							
10%	16%	16%	14%	12%	11%	10%	13%
25%	17%	16%	18%	18%	19%	19%	18%
45%	23%	50%	20%	40%	35%	34%	34%
50%	40%	39%	39%	38%	38%	38%	39%
65%	40%	n/a	7%	3%	0%	0%	3%
75%	65%	63%	64%	64%	64%	63%	64%
90%	80%	79%	79%	78%	77%	75%	78%
95%	n/a	n/a	0%	0%	0%	0%	0%
100%	93%	92%	91%	91%	90%	90%	91%

Section V – Assumptions Specific to the Health Trust and Life Trust

Summary of Medical Insurance Election Rates			
TRS Contribution %	Experience	Current	Proposed
10%	13%	20%	***20%***
25%	18%	20%	***20%***
45%	34%	41%	***40%***
50%	39%	49%	***40%***
65%	3%	61%	***50%***
75%	64%	70%	***70%***
90%	78%	76%	***80%***
95%	0%	84%	***85%***
100%	91%	91%	***90%***

Section V – Assumptions Specific to the Health Trust and Life Trust

Plan Elections

Background: As KEHP costs vary by plan, the future level of participation in the plans for covered members under 65 should be considered based upon historical participation rates, and how plan eligibility rules, plan choices, and retiree contribution rates have changed over time.

Determination: Based upon recent experience, plan election options can change, and plan election rates can shift over time. As a result, continued monitoring of experience and annual updating of the KEHP coverage assumption is proposed.

Valuation Date	LivingWell Basic	LivingWell Limited	LivingWell CDHP	LivingWell PPO	Standard PPO	Standard CDHP	Total
KEHP Retiree Coverage Elections							
6/30/2016	n/a	n/a	4,677	5,337	757	902	11,673
6/30/2017	n/a	n/a	4,620	4,783	298	1,246	10,947
6/30/2018	n/a	n/a	4,615	4,341	247	1,369	10,572
6/30/2019	295	110	5,044	4,595	n/a	n/a	10,044
6/30/2020	271	60	5,313	4,177	n/a	n/a	9,821
KEHP Retiree Coverage Election %s							
6/30/2016	n/a	n/a	40%	46%	6%	8%	100%
6/30/2017	n/a	n/a	42%	44%	3%	11%	100%
6/30/2018	n/a	n/a	44%	41%	2%	13%	100%
6/30/2019	3%	1%	50%	46%	n/a	n/a	100%
6/30/2020	3%	1%	53%	43%	n/a	n/a	100%

Section V – Assumptions Specific to the Health Trust and Life Trust

Spouse Participation

Background: Those who are eligible for coverage under the plan should be considered and appropriate assumptions made regarding the coverage of spouses and dependents. Additionally, the impact of plan rules governing changes in coverage after retirement, such as remarriage, if significant should be considered. A review of historical data on spouse and dependent coverage rates when selecting the assumption to be used in the projection should be made.

Determination: The percentage of those electing Health Trust coverage for their spouses has remained steady over time and Health Trust's benefits and rules regarding dependent coverage are not anticipated to change. As a result, the use of the historical spouse coverage election average is proposed.

Valuation Date	Gender		
	Male	Female	Total
Number of Pre-Medicare Retirees Electing to Cover a Spouse			
6/30/2016	649	1,608	2,257
6/30/2017	608	1,964	2,572
6/30/2018	708	2,060	2,768
6/30/2019	671	2,009	2,680
6/30/2020	755	2,076	2,831
Number of Pre-Medicare Retirees Electing Coverage			
6/30/2016	2,496	9,177	11,673
6/30/2017	2,289	8,658	10,947
6/30/2018	2,245	8,327	10,572
6/30/2019	2,103	7,941	10,044
6/30/2020	2,152	7,669	9,821
% Electing Spousal Coverage			
6/30/2016	26%	18%	19%
6/30/2017	27%	23%	23%
6/30/2018	32%	25%	26%
6/30/2019	32%	25%	27%
6/30/2020	35%	27%	29%
Current Assumption	25%	15%	
Proposed %	***30%***	***25%***	

Section V – Assumptions Specific to the Health Trust and Life Trust

Terminated and Vested Participation

Background: Although eligible inactive members may begin receiving benefits once meeting the age and service requirements for retirement eligibility, some members may withdraw, and those members electing to receive benefits may not begin receiving benefits at the earliest eligibility date. For eligible inactive members, a rate of benefit participation and an average age in which benefits are to begin must be assumed.

Determination: Based upon the four most recent years of experience, the rates of withdrawal for those active members under the age of 55 who have less than 27 years of service have remained the same. As the average rate of withdrawal has remained relatively steady over time, the use of the historical average is proposed for members under the age of 55 who have less than 27 years of service. We have determined that continuing to use the same rates of vested and terminated benefit participation is appropriate at this time.

Section V – Assumptions Specific to the Health Trust and Life Trust

Rates of Withdrawal for the Initial Termination of an Active Employee			
Experience Period	**Years of Service**		
	5 - 10	**10 - 15**	**15 - 27**
Number of Active Members Under Age 55 Entering Vested and Terminated Status			
7/1/2015 - 6/30/2016	516	212	85
7/1/2016 - 6/30/2017	424	179	81
7/1/2017 - 6/30/2018	398	182	93
7/1/2018 - 6/30/2019	367	165	119
7/1/2019 - 6/30/2020	314	203	84
Number of Active Members Under Age 55 Entering Vested and Terminated Status or Withdrawing			
7/1/2015 - 6/30/2016	566	226	93
7/1/2016 - 6/30/2017	529	223	96
7/1/2017 - 6/30/2018	553	232	101
7/1/2018 - 6/30/2019	465	221	137
7/1/2019 - 6/30/2020	384	244	106
% of Active Members Under Age 55 Electing to Retain Membership upon Termination			
7/1/2015 - 6/30/2016	91%	94%	91%
7/1/2016 - 6/30/2017	80%	80%	84%
7/1/2017 - 6/30/2018	72%	78%	92%
7/1/2018 - 6/30/2019	79%	75%	87%
7/1/2019 - 6/30/2020	82%	83%	79%
Current Assumption	80%	85%	90%
Proposed %	***80%***	***85%***	***90%****

*To be used for all other age/service combinations.

% Receiving a Pension Benefit or Returning to Active Service for an Employee Currently in Deferred Vested Status				
	Years of Service			
	5 - 10	**10 - 15**	**15 - 27**	**27+**
Current Assumption	75%	85%	90%	75%
Proposed %	***75%***	***85%***	***90%***	***75%***

Section V – Assumptions Specific to the Health Trust and Life Trust

Determination: Based upon the four most recent years of experience, the average age vested participants being receiving a pension benefit has remained the same. As the average age of initial benefit receipt has remained relatively steady over time, the use of the historical average is proposed for the age of initial benefit receipt.

Experience Period	Years of Service							
	5 - 10	10 - 15	15 - 20	20 - 25	25 - 26	26 - 27	27+	Total
Average Age of Initial Pension Benefit								
7/1/2016 - 6/30/2017	62	60	59	58	55	58	59	60
7/1/2017 - 6/30/2018	63	61	61	58	60	59	60	61
7/1/2018 - 6/30/2019	62	61	60	57	60	56	63	61
7/1/2019 - 6/30/2020	63	60	59	56	59	53	61	60
Total	62	60	60	57	59	57	61	60
Average %	62	60	60	57	58	57	61	61
Current Assumption	*60*							
Proposed	***60***							

Section V – Assumptions Specific to the Health Trust and Life Trust

Spouse Age Difference

Background: The actual data for the age of the covered spouse and dependents of retired participants is used. The spouse and dependents of an active employee today may not be the same spouse and dependents covered at retirement; therefore the actuary should generally select an assumed covered spouse age difference for purposes of projecting future spouse coverage and assumed dependents' ages for projecting dependent coverage.

Determination: The average age difference between Health Trust covered male and female spouses has remained steady over time. As a result, we have determined that continued use of the historical average is appropriate, which supports maintaining current assumptions.

Valuation Date	Gender		
	Male	Female	Total
Average Age of Pre-Medicare Retiree Electing to Cover a Spouse			
6/30/2016	60	59	60
6/30/2017	59	60	60
6/30/2018	59	60	60
6/30/2019	59	60	60
6/30/2020	59	59	59
Average	*59*	*60*	*60*
Average Age of Coverage Spouse			
6/30/2016	56	60	59
6/30/2017	56	61	60
6/30/2018	57	61	60
6/30/2019	57	61	60
6/30/2020	56	61	60
Average	*56*	*61*	*60*
Age Difference			
6/30/2016	4	(1)	1
6/30/2017	3	(1)	0
6/30/2018	2	(1)	0
6/30/2019	2	(1)	0
6/30/2020	3	(2)	(1)
Total	*3*	*(1)*	*0*
Current Assumption	3	(1)	
Proposed %	***3***	***(1)***	

Section VI – Other Assumptions and Methods

ADMINISTRATIVE TOOLS: Any administrative tools utilized by the Retirement System should be revised to be based on the mortality table and investment rate of return used in the valuation.

OPTION FACTORS: The option factors currently used by the Retirement System are based on the mortality tables and investment rate of return (discount rate) used in the valuation. **The factors should be revised to be based on the mortality table determined for the valuation.**

ADMINISTRATIVE EXPENSE: Currently for TRS, there is no contribution made to pay the administrative expenses incurred each year. This results in losses to the system due to the expenses paid out each year. **After reviewing the total amount of administrative expenses for the past five years and the percentage of payroll, we have determined that an assumption of 0.32% of payroll should be used in the valuation and added to the total normal cost each year.** The following table shows actual percentages over the past five years:

($ in Thousands)

Year Ending June 30	Administrative Expenses	Annual Payroll	Percentage
2016	$8,636	$3,537,226	0.24%
2017	10,314	3,563,584	0.29%
2018	11,388	3,605,116	0.32%
2019	12,352	3,648,428	0.34%
2020	12,167	3,723,482	0.33%

PERCENT MARRIED: Currently, 100% of all members are assumed to be married with the male three years older than his spouse. This assumption is used to determine if anyone is entitled to a Survivor Benefit from a death in active service. The survivor benefits for members with 10 years of service before death can be paid to either spouses or dependent children or other dependents. An analysis of active members shows that mostly all of all active members have listed either a spouse or a dependent beneficiary on file. Therefore, **we determined that no change in this assumption is necessary at this time.**

Section VI – Other Assumptions and Methods

PART-TIMERS: Currently, we assume that all part time employees will accrue 0.25 years of service each year while in that status. After review of the data for the past 5 years, part-timers are averaging 0.247 years of service each year, therefore, **we have determined that no change in this assumption is necessary at this**

UNUSED SICK LEAVE: Currently, we assume a load of 2.0% to all active liability for all unused sick leave added at retirement. TRS staff has supplied us with average service credits due to unused sick leave for those active members that retired in the last 4 years that were not in Local School Districts. The average unused sick leave credit for these individuals was approximately 0.50 years of service. For those active members retiring from the Local School Districts, Final Average Compensation is increased by the average additional payroll they received from their unused sick leave time. Average additional payroll for these members averaged around $13,500. Using these figures, we are computing that the load for unused sick leave should be 3.0% and **we have determined that there should be an increase to the load from 2.0% to 3.0% for all active liability at the time of retirement.**

Appendix A – Historical June CPI (U) Index

Year	CPI (U)	Year	CPI (U)
1965	31.6	1993	144.4
1966	32.4	1994	148.0
1967	33.3	1995	152.5
1968	35.7	1996	156.7
1969	34.7	1997	160.3
1970	38.8	1998	163.0
1971	40.6	1999	166.2
1972	41.7	2000	172.4
1973	44.2	2001	178.0
1974	49.0	2002	179.9
1975	53.6	2003	183.7
1976	56.8	2004	189.7
1977	60.7	2005	194.5
1978	65.2	2006	202.9
1979	72.3	2007	208.352
1980	82.7	2008	218.815
1981	90.6	2009	215.693
1982	97.0	2010	217.965
1983	99.5	2011	225.722
1984	103.7	2012	229.478
1985	107.6	2013	233.504
1986	109.5	2014	238.343
1987	113.5	2015	238.638
1988	118.0	2016	241.018
1989	124.1	2017	244.955
1990	129.9	2018	251.989
1991	136.0	2019	256.143
1992	140.2	2020	257.797

Appendix B – Capital Market Assumptions and Asset Allocations

Aon's 30-year Geometric Real Rates of Return and Standard Deviations by Asset Class

Asset Class	Expected Geometric Real Rates of Return	Standard Deviation
Large Cap U.S. Equity	4.2%	17.0%
Small Cap U.S. Equity	4.7%	23.0%
Developed International Equity	5.3%	20.0%
Emerging Markets Equity	5.4%	27.0%
Fixed Income	(0.1)%	4.5%
High Yield Bonds	1.7%	12.5%
Other Additional Categories	2.2%	9.7%
Real Estate	4.0%	17.4%
Private Equity	6.9%	25.0%
Cash	(0.3)%	2.0%

Long Term Asset Allocation Targets

Asset Class	Asset Allocation
Large Cap U.S. Equity	37.4%
Small Cap U.S. Equity	2.6%
Developed International Equity	16.5%
Emerging Markets Equity	5.5%
Fixed Income	15.0%
High Yield Bonds	2.0%
Other Additional Categories	5.0%
Real Estate	7.0%
Private Equity	7.0%
Cash	2.0%

Appendix C – Social Security Administration Wage Index

Year	Wage Index	Annual Increase	Year	Wage Index	Annual Increase
1962	$4,291.40		1991	21,811.60	3.73
1963	4,396.64	2.45%	1992	22,935.42	5.15
1964	4,576.32	4.09	1993	23,132.67	0.86
1965	4,658.72	1.80	1994	23,753.53	2.68
1966	4,938.36	6.00	1995	24,705.66	4.01
1967	5,213.44	5.57	1996	25,913.90	4.89
1968	5,571.76	6.87	1997	27,426.00	5.84
1969	5,893.76	5.78	1998	28,861.44	5.23
1970	6,186.24	4.96	1999	30,469.84	5.57
1971	6,497.08	5.02	2000	32,154.82	5.53
1972	7,133.80	9.80	2001	32,921.92	2.39
1973	7,580.16	6.26	2002	33,252.09	1.00
1974	8,030.76	5.94	2003	34,064.95	2.44
1975	8,630.92	7.47	2004	35,648.55	4.65
1976	9,226.48	6.90	2005	36,952.94	3.66
1977	9,779.44	5.99	2006	38,651.41	4.60
1978	10,556.03	7.94	2007	40,405.48	4.54
1979	11,479.46	8.75	2008	41,334.97	2.30
1980	12,513.46	9.01	2009	40,711.61	(1.50)
1981	13,773.10	10.07	2010	41,673.83	2.36
1982	14,531.34	5.51	2011	42,979.61	3.13
1983	15,239.24	4.87	2012	44,321.67	3.12
1984	16,135.07	5.88	2013	44,888.16	1.28
1985	16,822.51	4.26	2014	46,481.52	3.55
1986	17,321.82	2.97	2015	48,098.63	3.48
1987	18,426.51	6.38	2016	48,642.15	1.13
1988	19,334.04	4.93	2017	50,321.89	3.45
1989	20,099.55	3.96	2018	52,145.80	3.62
1990	21,027.98	4.62	2019	54,099.99	3.75

Appendix D – Determined Rates

TABLE 1
RATES OF SEPARATION FROM ACTIVE SERVICE – MALES

	RATES OF WITHDRAWAL						
	Service						
AGE	0 – 4	5 – 9	10+	DEATH	DISABILITY	RATES OF RETIREMENT BEFORE 27 YEARS OF SERVICE	RATES OF RETIREMENT AFTER 27 YEARS OF SERVICE*
20	0.2000			0.000309	0.00010		
21	0.2000			0.000263	0.00010		
22	0.2000			0.000227	0.00010		
23	0.1100			0.000200	0.00010		
24	0.1100			0.000183	0.00010		
25	0.1100	0.0325		0.000200	0.00010		
26	0.1100	0.0325		0.000218	0.00010		
27	0.1100	0.0325		0.000236	0.00010		
28	0.1000	0.0360		0.000267	0.00010		
29	0.1000	0.0360		0.000285	0.00010		
30	0.1000	0.0360	0.0280	0.000315	0.00010		
31	0.1000	0.0360	0.0280	0.000332	0.00012		
32	0.1000	0.0360	0.0280	0.000360	0.00014		
33	0.1100	0.0360	0.0155	0.000373	0.00016		
34	0.1100	0.0360	0.0155	0.000398	0.00018		
35	0.1100	0.0360	0.0155	0.000419	0.00020		
36	0.1100	0.0360	0.0155	0.000436	0.00030		
37	0.1100	0.0360	0.0155	0.000463	0.00040		
38	0.1250	0.0400	0.0125	0.000474	0.00050		
39	0.1250	0.0400	0.0125	0.000494	0.00060		
40	0.1250	0.0400	0.0125	0.000522	0.00070		
41	0.1250	0.0400	0.0125	0.000548	0.00092		
42	0.1250	0.0400	0.0125	0.000582	0.00114		
43	0.1150	0.0400	0.0110	0.000616	0.00136		
44	0.1150	0.0400	0.0110	0.000669	0.00158		
45	0.1150	0.0400	0.0110	0.000722	0.00180		0.1700
46	0.1150	0.0400	0.0110	0.000786	0.00200		0.1700
47	0.1150	0.0400	0.0110	0.000863	0.00220		0.1700
48	0.1425	0.0450	0.0110	0.000942	0.00240		0.1700
49	0.1425	0.0450	0.0110	0.001045	0.00260		0.1700
50	0.1425	0.0450	0.0110	0.001153	0.00280		0.2500
51	0.1425	0.0450	0.0110	0.001266	0.00304		0.2200
52	0.1425	0.0450	0.0110	0.001403	0.00328		0.2000
53	0.1500	0.0600	0.0125	0.001547	0.00352		0.1500
54	0.1500	0.0600	0.0125	0.001697	0.00376		0.1400
55	0.1500	0.0600	0.0125	0.001871	0.00400	0.0525	0.4000
56	0.1500	0.0600	0.0000	0.002060	0.00420	0.0525	0.4000
57	0.1500	0.0600	0.0000	0.002270	0.00440	0.0625	0.3700
58	0.1500	0.0600	0.0000	0.002499	0.00460	0.0625	0.3400
59	0.1500	0.0600	0.0000	0.002755	0.00480	0.0625	0.2700
60	0.1500	0.0000	0.0000	0.003041	0.00500	0.1350	0.3300
61	0.1500	0.0000	0.0000	0.003344	0.00500	0.1500	0.3000
62	0.1500	0.0000	0.0000	0.003660	0.00500	0.1500	0.3000
63	0.2000	0.0000	0.0000	0.004007	0.00500	0.1500	0.3000
64	0.2000	0.0000	0.0000	0.004385	0.00500	0.1500	0.3000
65	0.2000	0.0000	0.0000	0.004775	0.00500	0.2000	0.3000
66	0.2000	0.0000	0.0000	0.005201	0.00500	0.2200	0.3000
67	0.2000	0.0000	0.0000	0.005657	0.00500	0.2500	0.2500
68	0.2000	0.0000	0.0000	0.006157	0.00500	0.2500	0.2500
69	0.2000	0.0000	0.0000	0.006677	0.00500	0.2500	0.2500
70	0.2000	0.0000	0.0000	0.007232	0.00500	0.2500	0.3000
71	0.2000	0.0000	0.0000	0.007833	0.00500	0.2500	0.3000
72	0.2000	0.0000	0.0000	0.008479	0.00500	0.2500	0.3000
73	0.2000	0.0000	0.0000	0.009174	0.00500	0.2500	0.3000
74	0.2000	0.0000	0.0000	0.009950	0.00500	0.2500	0.3000
75	0.2000	0.0000	0.0000	0.011408	0.00500	1.0000	1.0000

*Plus 8.5% in year when first eligible for unreduced retirement with 27 years of service.

Appendix D – Determined Rates

TABLE 2
RATES OF SEPARATION FROM ACTIVE SERVICE – FEMALES

	RATES OF WITHDRAWAL						
	Service						
AGE	0 – 4	5 – 9	10+	RATES OF DEATH	RATES OF DISABILITY	RATES OF RETIREMENT BEFORE 27 YEARS OF SERVICE	RATES OF RETIREMENT AFTER 27 YEARS OF SERVICE*
20	0.1300			0.000135	0.00010		
21	0.1300			0.000135	0.00010		
22	0.1300			0.000135	0.00010		
23	0.0900			0.000127	0.00010		
24	0.0900			0.000108	0.00010		
25	0.0900	0.0450		0.000099	0.00010		
26	0.0900	0.0450		0.000102	0.00012		
27	0.0900	0.0450		0.000104	0.00014		
28	0.1100	0.0425		0.000118	0.00016		
29	0.1100	0.0425		0.000120	0.00018		
30	0.1100	0.0425	0.0100	0.000134	0.00020		
31	0.1100	0.0425	0.0100	0.000149	0.00028		
32	0.1100	0.0425	0.0100	0.000176	0.00036		
33	0.1100	0.0350	0.0160	0.000190	0.00044		
34	0.1100	0.0350	0.0160	0.000203	0.00052		
35	0.1100	0.0350	0.0160	0.000215	0.00060		
36	0.1100	0.0350	0.0160	0.000238	0.00068		
37	0.1100	0.0350	0.0160	0.000247	0.00076		
38	0.1250	0.0400	0.0120	0.000267	0.00084		
39	0.1250	0.0400	0.0120	0.000284	0.00092		
40	0.1250	0.0400	0.0120	0.000299	0.00100		
41	0.1250	0.0400	0.0120	0.000324	0.00128		
42	0.1250	0.0400	0.0120	0.000335	0.00156		
43	0.1350	0.0400	0.0100	0.000356	0.00184		
44	0.1350	0.0400	0.0100	0.000376	0.00212		
45	0.1350	0.0400	0.0100	0.000405	0.00240		0.1700
46	0.1350	0.0400	0.0100	0.000425	0.00268		0.1700
47	0.1350	0.0400	0.0100	0.000455	0.00296		0.1700
48	0.1500	0.0450	0.0125	0.000495	0.00324		0.1700
49	0.1500	0.0450	0.0125	0.000538	0.00352		0.1700
50	0.1500	0.0450	0.0125	0.000584	0.00380		0.2000
51	0.1500	0.0450	0.0125	0.000633	0.00404		0.2000
52	0.1500	0.0450	0.0125	0.000687	0.00428		0.2000
53	0.1500	0.0500	0.0160	0.000754	0.00452		0.2000
54	0.1500	0.0500	0.0160	0.000834	0.00476		0.1500
55	0.1500	0.0500	0.0160	0.000908	0.00500	0.0500	0.5000
56	0.1500	0.0500	0.0000	0.000995	0.00520	0.0700	0.5000
57	0.1500	0.0500	0.0000	0.001092	0.00540	0.0700	0.4000
58	0.1750	0.0750	0.0000	0.001188	0.00560	0.0700	0.4000
59	0.1750	0.0750	0.0000	0.001290	0.00580	0.0700	0.4000
60	0.1750	0.0000	0.0000	0.001407	0.00600	0.1500	0.4000
61	0.1750	0.0000	0.0000	0.001526	0.00610	0.1500	0.4000
62	0.1750	0.0000	0.0000	0.001656	0.00620	0.1500	0.4000
63	0.2500	0.0000	0.0000	0.001796	0.00630	0.1800	0.4000
64	0.2500	0.0000	0.0000	0.001955	0.00640	0.1800	0.4000
65	0.2500	0.0000	0.0000	0.002123	0.00650	0.2500	0.4000
66	0.2500	0.0000	0.0000	0.002321	0.00650	0.2500	0.4000
67	0.2500	0.0000	0.0000	0.002541	0.00650	0.2500	0.4000
68	0.2500	0.0000	0.0000	0.002795	0.00650	0.2500	0.3500
69	0.2500	0.0000	0.0000	0.003086	0.00650	0.2500	0.3500
70	0.2500	0.0000	0.0000	0.003435	0.00650	0.3000	0.3500
71	0.2500	0.0000	0.0000	0.003853	0.00650	0.3000	0.3500
72	0.2500	0.0000	0.0000	0.004342	0.00650	0.3000	0.3500
73	0.2500	0.0000	0.0000	0.004922	0.00650	0.3000	0.3500
74	0.2500	0.0000	0.0000	0.005606	0.00650	0.3000	0.3500
75	0.2500	0.0000	0.0000	0.006389	0.00650	1.0000	1.0000

*Plus 10.0% in year when first eligible for unreduced retirement with 27 years of service.

Appendix D – Determined Rates

TABLE 3

RATES OF ANTICIPATED MERIT SALARY INCREASES
(For Both Males and Females)

SERVICE	RATE*
1	1.0475
2	1.0275
3	1.0225
4	1.0225
5	1.0225
6	1.0150
7	1.0150
8	1.0150
9	1.0150
10	1.0050
11	1.0050
12	1.0050
13	1.0050
14	1.0050
15	1.0050
16	1.0050
17	1.0050
18	1.0050
19	1.0050
20+	1.0025

*Does not include wage inflation assumption at 2.75% per annum.

Appendix D – Determined Rates

TABLE 4

RATES OF MORTALITY FOR MEMBERS RETIRED ON ACCOUNT OF SERVICE*

AGE	MALES	FEMALES	AGE	MALES	FEMALES
19	0.000306	0.000118	71	0.016004	0.011015
20	0.000255	0.000098	72	0.018207	0.012554
21	0.000214	0.000088	73	0.020716	0.014318
22	0.000184	0.000088	74	0.023582	0.016346
23	0.000163	0.000088	75	0.026816	0.018649
24	0.000173	0.000098	76	0.030457	0.021266
25	0.000184	0.000098	77	0.034578	0.024245
26	0.000194	0.000108	78	0.039229	0.027616
27	0.000214	0.000118	79	0.044503	0.031458
28	0.000224	0.000137	80	0.050500	0.035819
29	0.000245	0.000147	81	0.057324	0.040778
30	0.000255	0.000157	82	0.065066	0.046413
31	0.000275	0.000167	83	0.073807	0.052783
32	0.000286	0.000186	84	0.083620	0.059976
33	0.000306	0.000196	85	0.094585	0.068071
34	0.000326	0.000216	86	0.106784	0.077165
35	0.000347	0.000235	87	0.120309	0.087387
36	0.000377	0.000255	88	0.135252	0.098872
37	0.000398	0.000284	89	0.151562	0.111769
38	0.000428	0.000304	90	0.169116	0.126077
39	0.000469	0.000333	91	0.187772	0.141757
40	0.000510	0.000363	92	0.207335	0.158682
41	0.000561	0.000402	93	0.227603	0.176674
42	0.000612	0.000431	94	0.248370	0.195559
43	0.000683	0.000470	95	0.269423	0.215110
44	0.000755	0.000519	96	0.290578	0.235131
45	0.000836	0.000568	97	0.311681	0.255466
46	0.000928	0.000617	98	0.332612	0.275968
47	0.001020	0.000666	99	0.353287	0.296597
48	0.001132	0.000715	100	0.373728	0.317344
49	0.001244	0.000774	101	0.393761	0.338041
50	0.001357	0.000843	102	0.413222	0.358494
51	0.001489	0.000902	103	0.431990	0.378525
52	0.001622	0.000970	104	0.449953	0.397968
53	0.002275	0.001891	105	0.467017	0.416686
54	0.002499	0.002048	106	0.483113	0.434542
55	0.002744	0.002215	107	0.498199	0.451457
56	0.003019	0.002401	108	0.510000	0.467362
57	0.003315	0.002597	109	0.510000	0.482209
58	0.003641	0.002813	110	0.510000	0.490000
59	0.004009	0.003058	111	0.510000	0.490000
60	0.004427	0.003322	112	0.510000	0.490000
61	0.004886	0.003626	113	0.510000	0.490000
62	0.005426	0.003969	114	0.510000	0.490000
63	0.006038	0.004371	115	0.510000	0.490000
64	0.006752	0.004822	116	0.510000	0.490000
65	0.007579	0.005351	117	0.510000	0.490000
66	0.008537	0.005968	118	1.000000	1.000000
67	0.009639	0.006693	119	1.000000	1.000000
68	0.010914	0.007546	120	1.000000	1.000000
69	0.012383	0.008536			
70	0.014066	0.009682			

*Base rates before applying a modified MP-2020 improvement scale projected generationally.

Appendix D – Determined Rates

TABLE 5

RATES OF MORTALITY FOR MEMBERS RETIRED ON ACCOUNT OF DISABILITY*

AGE	MALES	FEMALES	AGE	MALES	FEMALES
19	0.003955	0.000113	71	0.041702	0.025436
20	0.003706	0.002312	72	0.044150	0.026903
21	0.003379	0.002303	73	0.046848	0.028567
22	0.003034	0.002190	74	0.049843	0.030447
23	0.002774	0.002021	75	0.053155	0.032562
24	0.002669	0.001824	76	0.056842	0.034949
25	0.002803	0.001654	77	0.060931	0.037628
26	0.002938	0.001542	78	0.065491	0.040627
27	0.003082	0.001542	79	0.070541	0.043973
28	0.003235	0.001683	80	0.076118	0.047705
29	0.003398	0.001842	81	0.082224	0.051860
30	0.003571	0.002021	82	0.088886	0.056466
31	0.003754	0.002209	83	0.096096	0.061570
32	0.003946	0.002416	84	0.103824	0.067210
33	0.004166	0.002641	85	0.112109	0.073423
34	0.004397	0.002886	86	0.121008	0.080238
35	0.004666	0.003158	87	0.130589	0.087711
36	0.004973	0.003450	88	0.142666	0.095532
37	0.005328	0.003769	89	0.156029	0.103532
38	0.005731	0.004117	90	0.169738	0.111653
39	0.006192	0.004503	91	0.183610	0.119916
40	0.006720	0.004926	92	0.197645	0.128451
41	0.007325	0.005396	93	0.211949	0.137400
42	0.008006	0.005913	94	0.226723	0.146969
43	0.008794	0.006477	95	0.242170	0.157356
44	0.009667	0.007088	96	0.258470	0.168777
45	0.010646	0.007755	97	0.275741	0.181401
46	0.011722	0.008479	98	0.293990	0.195370
47	0.012883	0.009259	99	0.313046	0.210974
48	0.014112	0.010086	100	0.332506	0.227724
49	0.015408	0.010970	101	0.351744	0.245669
50	0.016435	0.011910	102	0.370598	0.264704
51	0.017453	0.012906	103	0.388915	0.284491
52	0.018442	0.013940	104	0.406579	0.304391
53	0.019392	0.014429	105	0.423485	0.324244
54	0.020294	0.014918	106	0.439546	0.343861
55	0.021130	0.015416	107	0.454694	0.363075
56	0.021888	0.015905	108	0.468893	0.381725
57	0.022608	0.016375	109	0.480000	0.399679
58	0.023309	0.016817	110	0.480000	0.416805
59	0.024029	0.017230	111	0.480000	0.433030
60	0.024806	0.017616	112	0.480000	0.448286
61	0.025699	0.017992	113	0.480000	0.462527
62	0.026736	0.018386	114	0.480000	0.470000
63	0.027917	0.018800	115	0.480000	0.470000
64	0.029222	0.019279	116	0.480000	0.470000
65	0.030653	0.019834	117	0.480000	0.470000
66	0.032189	0.020473	118	0.480000	0.470000
67	0.033830	0.021206	119	1.000000	0.470000
68	0.035578	0.022052	120	1.000000	1.000000
69	0.037450	0.023030			
70	0.039485	0.024149			

*Base rates before applying a modified MP-2020 improvement scale projected generationally.

Appendix D – Determined Rates

TABLE 6

RATES OF MORTALITY FOR BENEFICIARIES OF DECEASED MEMBERS*

AGE	MALES	FEMALES	AGE	MALES	FEMALES
19	0.000303	0.000130	71	0.028391	0.014780
20	0.000253	0.000130	72	0.031148	0.016190
21	0.000212	0.000120	73	0.034158	0.017770
22	0.000182	0.000100	74	0.037431	0.019530
23	0.000162	0.000090	75	0.041006	0.021510
24	0.000172	0.000090	76	0.044945	0.023710
25	0.000182	0.000090	77	0.049288	0.026190
26	0.000192	0.000100	78	0.054136	0.028980
27	0.000212	0.000100	79	0.059560	0.032140
28	0.000222	0.000110	80	0.065630	0.035730
29	0.000242	0.000120	81	0.072407	0.039850
30	0.000253	0.000140	82	0.079942	0.044550
31	0.000273	0.000150	83	0.088304	0.049940
32	0.000283	0.000160	84	0.097546	0.056110
33	0.000303	0.000170	85	0.107717	0.063160
34	0.000323	0.000190	86	0.118857	0.071220
35	0.000343	0.000200	87	0.131078	0.080300
36	0.000374	0.000220	88	0.145622	0.090410
37	0.000394	0.000240	89	0.161065	0.101460
38	0.000424	0.000260	90	0.177306	0.113290
39	0.000465	0.000290	91	0.194284	0.125960
40	0.000505	0.000310	92	0.211959	0.139520
41	0.000556	0.000340	93	0.230280	0.154010
42	0.000606	0.000370	94	0.249207	0.169460
43	0.005545	0.000410	95	0.268670	0.185900
44	0.005777	0.000440	96	0.288597	0.203320
45	0.006020	0.002620	97	0.308868	0.221690
46	0.006272	0.002730	98	0.329351	0.240940
47	0.006525	0.002840	99	0.349824	0.260970
48	0.007080	0.002960	100	0.370064	0.281600
49	0.007312	0.003080	101	0.389900	0.302650
50	0.007545	0.003200	102	0.409171	0.323820
51	0.007787	0.003420	103	0.427755	0.344940
52	0.008050	0.003660	104	0.445541	0.365810
53	0.008322	0.003910	105	0.462439	0.386250
54	0.008625	0.004170	106	0.478376	0.406090
55	0.008959	0.004460	107	0.493314	0.425190
56	0.009332	0.004760	108	0.505000	0.443410
57	0.009747	0.005080	109	0.505000	0.460670
58	0.010221	0.005430	110	0.505000	0.476900
59	0.010777	0.005810	111	0.505000	0.492050
60	0.011413	0.006220	112	0.505000	0.500000
61	0.012140	0.006670	113	0.505000	0.500000
62	0.012989	0.007170	114	0.505000	0.500000
63	0.013978	0.007720	115	0.505000	0.500000
64	0.015120	0.008330	116	0.505000	0.500000
65	0.016443	0.008990	117	0.505000	0.500000
66	0.017938	0.009730	118	1.000000	0.500000
67	0.019624	0.010530	119	1.000000	0.500000
68	0.021503	0.011430	120	1.000000	1.000000
69	0.023584	0.012420			
70	0.025876	0.013530			

*Base rates before applying a modified MP-2020 improvement scale projected generationally.

Appendix E – Resolutions to the Board

ADOPTION OF TABLES HEREIN PRESENTED

In order that the tables herein presented may have the official approval of the Board of Trustees, the following resolutions have been determined for adoption.

WHEREAS, The investigation of the mortality, service and compensation experience of the members of the Teachers' Retirement System of the State of Kentucky which was prepared as of June 30, 2020 indicated that the mortality tables and active service tables previously adopted by the Board of Trustees require modification in order that they may reflect more closely the actual past experience of the membership, and

WHEREAS, The actuary has prepared new tables of rates for adoption, therefore, be it

RESOLVED, That the Board of Trustees, acting in accordance with Section 161.400 of the retirement law and upon the determination of the actuary, hereby discontinues the use in calculating the State's rates of contribution and in valuing the liabilities of the System of the active service tables and mortality tables currently in use, and approves for use instead the attached active service tables, and mortality tables, and be it further

RESOLVED, That the use of the new tables in the valuation as of June 30, 2021 and in all actuarial valuations thereafter, is hereby approved.

Appendix E – Resolutions to the Board

The Board of Trustees of the Teachers' Retirement System of the State of Kentucky approved the preceding resolution at a meeting held on September XX, 2021.

BOARD OF TRUSTEES,
TEACHERS' RETIREMENT SYSTEM OF THE STATE OF KENTUCKY

By ……
Chairperson

Attest:

……..
Secretary

TO: Board of Trustees of the Teachers' Retirement System of the State of Kentucky

FROM: Gary L. Harbin, CPA
Executive Secretary

DATE: June 21, 2021

SUBJECT: Executive Secretary's Observations and Comments

1. Number of Retirements: The preliminary number of retirements for June/July this year was one of the fewest in the last 17 years, during which time the average was 1,211 a year. The chart below lists the number of June/July retirements over those 17 years.

School Year Ended	Number of Retirees
2021	1,058
2020	962
2019	1,043
2018	1,381
2017	1,269
2016	1,294
2015	1,699
2014	1,267
2013	1,310
2012	1,405
2011	1,159
2010	1,203
2009	1,010
2008	1,353
2007	979
2006	1,098
2005	1,100

2. Executive Secretary serving as President of Public Sector Healthcare Roundtable: I serve as the president of the Public Sector Healthcare Roundtable. The roundtable is a national coalition of public sector health care purchasers that has been formed to ensure the interests of the public sector are represented properly during the formulation and debate of federal health care reform initiatives. The roundtable is governed by a board of directors and is managed by a governmental affairs firm based in Alexandria, Virginia.

3. Executive Secretary's Meetings: I have met with several groups recently and will report to the board concerning the following:

March 24, 2021	Conference call with Ice Miller
April 12-14, 2021	Attended NIRS Conference
April 15, 2021	Attended meeting with Morehead State University personnel
April 19, 2021	Attended Kentucky Retired Teachers Association conference

April 20, 2021	Attended meeting with Aon Investments USA
April 21, 2021	Attended NCTR Administrator Education Committee meeting
April 30, 2021	Attended Public Sector Healthcare Roundtable board meeting
May 4, 2021	Meeting with Todd Asset Management
May 13, 2021	Meeting with public relations consultant
May 21, 2021	Meeting with actuary
May 26, 2021	Meeting with KRTA
May 26, 2021	Meeting with McLagan Partners
May 27, 2021	Attended Public Sector Healthcare Roundtable board meeting
June 1, 2021	Attended Know Your Rx Coalition Board Meeting
June 1, 2021	Meeting with McLagan Partners

4. Coronavirus response: During the global pandemic of COVID-19, TRS has performed without interruption, providing all our services to members. For most of that time, about 90 to 95% of employees worked from home. The office remained closed to visitors until June 11. Members are asked to make appointments for in-office counseling. The success of video counseling, which allows members and retires to conduct their business from the convenience of home, continues. Seminars continue to be conducted as webinars and, at least for the time being, board and committee meetings are conducted with public access using video teleconferencing.

5. Director of Retiree Health Care serving on SALGBA board: Jane Gilbert serves on the board of the State and Local Government Benefits Association (SALGBA), which is a national organization that provides its members with educational and collaborative support. Since its inception in 1982, SALGBA members have held educational conferences in major cities across the country.

SALGBA offers a continuing education program that provides accreditation as a Certified Government Benefits Administrator. Director Gilbert and TRS employee Leeann Uebel have achieved the accreditation.

6. Chief Financial Officer serving on GFOA and P2F2 committees: Mark Whelan serves on the Government Finance Officers Association (GFOA) Committee on Retirement Benefits and Administration. Also, the CFO has served on the GFOA Special Review Executive Committee. This committee is responsible for setting program policy for the Certificate of Achievement for Excellence in Financial Reporting Program. The CFO recently presented at a GFOA teleconference on pension plans' response to the coronavirus.

GFOA is a national organization with more than 20,000 members. The committee works with state and local administrators, trustees and personnel officials to manage state and local retirement funds and employee benefits effectively. The committee tracks new industry practices; regulatory and legislative developments; and issues best practices to assist public pension and personnel officers.

The CFO also serves on the board of the Public Pension Financial Forum (P2F2). The membership of P2F2 includes finance directors and professionals from all over the United States.

P2F2 is an education and professional networking organization that promotes financial excellence for public pension plans. P2F2 works with the Governmental Accounting Standards Board (GASB), Government Finance Officers Association (GFOA) and the American Institute of Certified Public Accountants (AICPA) with the development and implementation of accounting standards that affect public pension plans.

7. Internal Audit Director Serving on Association of Public Pension Fund Auditors (APPFA) Board: TRS Internal Auditor Nathan Van Sickel is serving a two-year term on the APPFA board.

8. GASB 68 and 75 Audit Reports: TRS's external auditor is finishing the audit reports used by employers to include cost allocations for pension and other postemployment benefits on their financial statements. TRS expects that the audit reports will be posted on the website by July 1.

9. Next Meeting: The board's next quarterly meeting will be September 20, 2021.