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Commonwealth of Kentucky

Pension Performance and Best Practices Analysis

Interim Report #2: Historical and Current Assessment

Summary Presentation to the
Public Pension Oversight Board

May 22, 2017

PFM Group
Consulting LLC

In conjunction with:
PRM Consulting Group
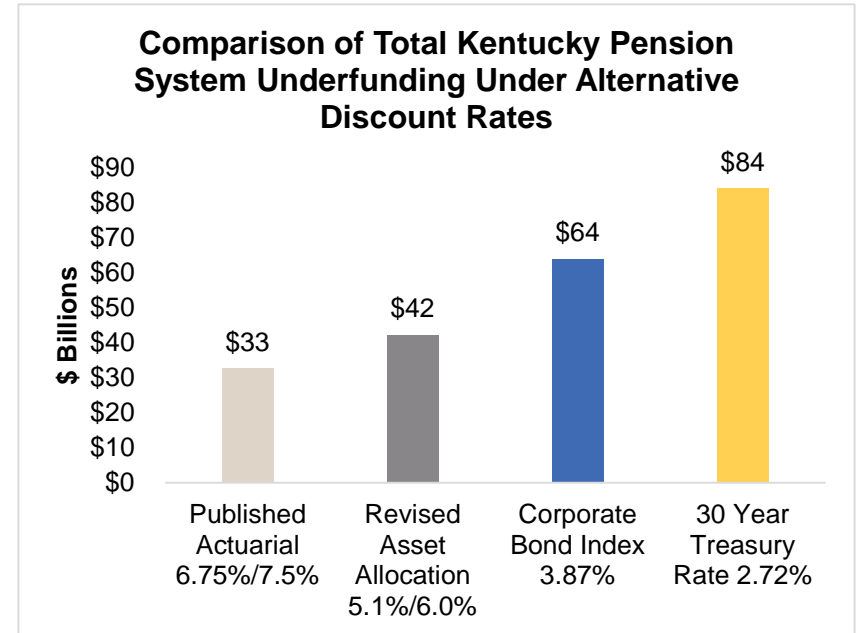Stites & Harbison PLLC

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The Magnitude of the Challenge

Kentucky Pension Liabilities are Severely Underfunded

- Kentucky's unfunded pension liability, already large in absolute and relative terms at $33 billion under published actuarial rates of return/discount rates, increases significantly when measured using alternative discount rates

- Based on alternate return assumptions for a 10-year investment horizon and increased liquidity positions generally consistent with evolving KRS practices, the unfunded liability would rise to $42 billion ("Revised Asset Allocation rate")

- Using weighted average rates across the yield curve for a corporate bond index used in private sector pension reporting ("Corporate Bond Index") the projected unfunded liability would total $64 billion

- With the equivalent average rate for U.S. Treasuries, it would total $84 billion – more than 7 times annual General Fund spending

Comparison of Total Kentucky Pension System Underfunding Under Alternative Discount Rates

(Chart: $ Billions)
- Published Actuarial 6.75%/7.5%: $33
- Revised Asset Allocation 5.1%/6.0%: $42
- Corporate Bond Index 3.87%: $64
- 30 Year Treasury Rate 2.72%: $84

Source: KRS, TRS, KJFRS Valuation Reports, PRM Consulting Group

The United States Government Accountability Office and the Society of Actuaries have observed that incorporating alternative discount rates up to and including a "risk-free rate" based on the U.S. Treasury yield curve helps measure the risk involved in the plan and its assumptions and liabilities.

Source: United States Government Accountability Office, *Pension Plan Valuation: Views on Using Multiple Measures to Offer a More Complete Financial Picture*, September 2014; Society of Actuaries, Report of the Blue Ribbon Panel on Public Pension Plan Funding, February 2014

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# Kentucky's Pension Liabilities are by Some Measures the Worst in the U.S.

- The Commonwealth's share of the retirement system's aggregate pension liabilities was measured by the bond rating agency Standard & Poor's as the worst-funded among all states for FY15, the most recent year analyzed

- Other recent measurements of net pension liabilities and the annual required contribution (ARC) compared to governmental revenues by Moody's Investors Service and the Center for Retirement Research at Boston College, respectively, have also found Kentucky to be among the four states with the highest stress due to pension obligations

FY2015 Worst-Funded Pension Ratios Aggregate of State Liabilities		
	Median	**74.6%**
	Average	**73.2%**
46	Rhode Island	55.5%
47	Connecticut	49.4%
48	Illinois	40.2%
49	New Jersey	37.8%
50	**Kentucky**	**37.4%**

Source: Standard & Poor's, *U.S. State Pensions: Weak Market Returns Will Contribute to Rise in Expense*, September 12, 2016

The Unfunded Liability of Kentucky's Two Largest State Pension Systems has Increased Dramatically

■ Unfunded Liabilities: KERS Non-Hazardous   ■ Unfunded Liabilities: KTRS
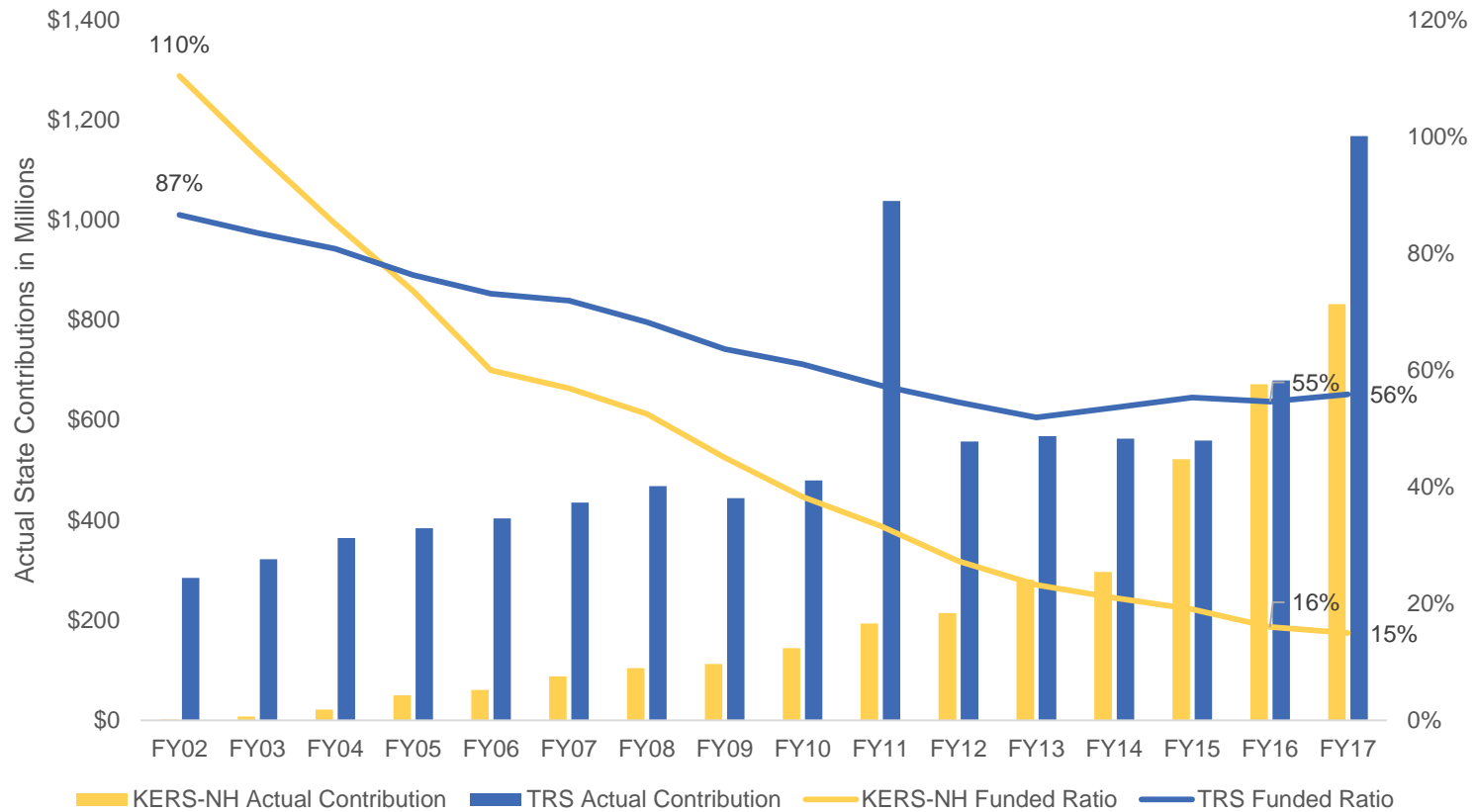
$ in Millions
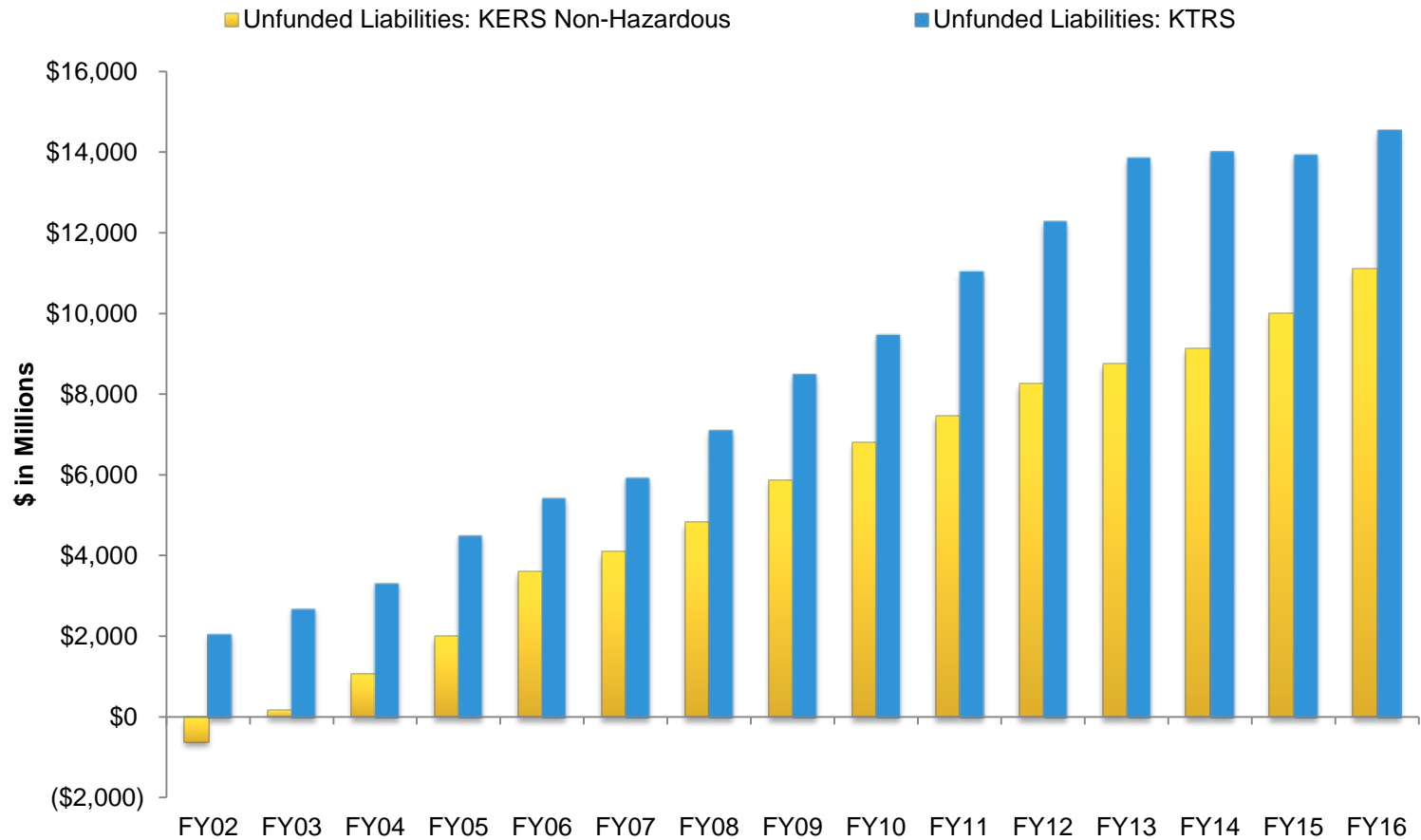
Source: Commonwealth of Kentucky valuation reports for KRS, TRS as of 6/30/16

Despite Increasing State Expenditures for the Largest Systems, Funded Ratios Have Sharply Declined

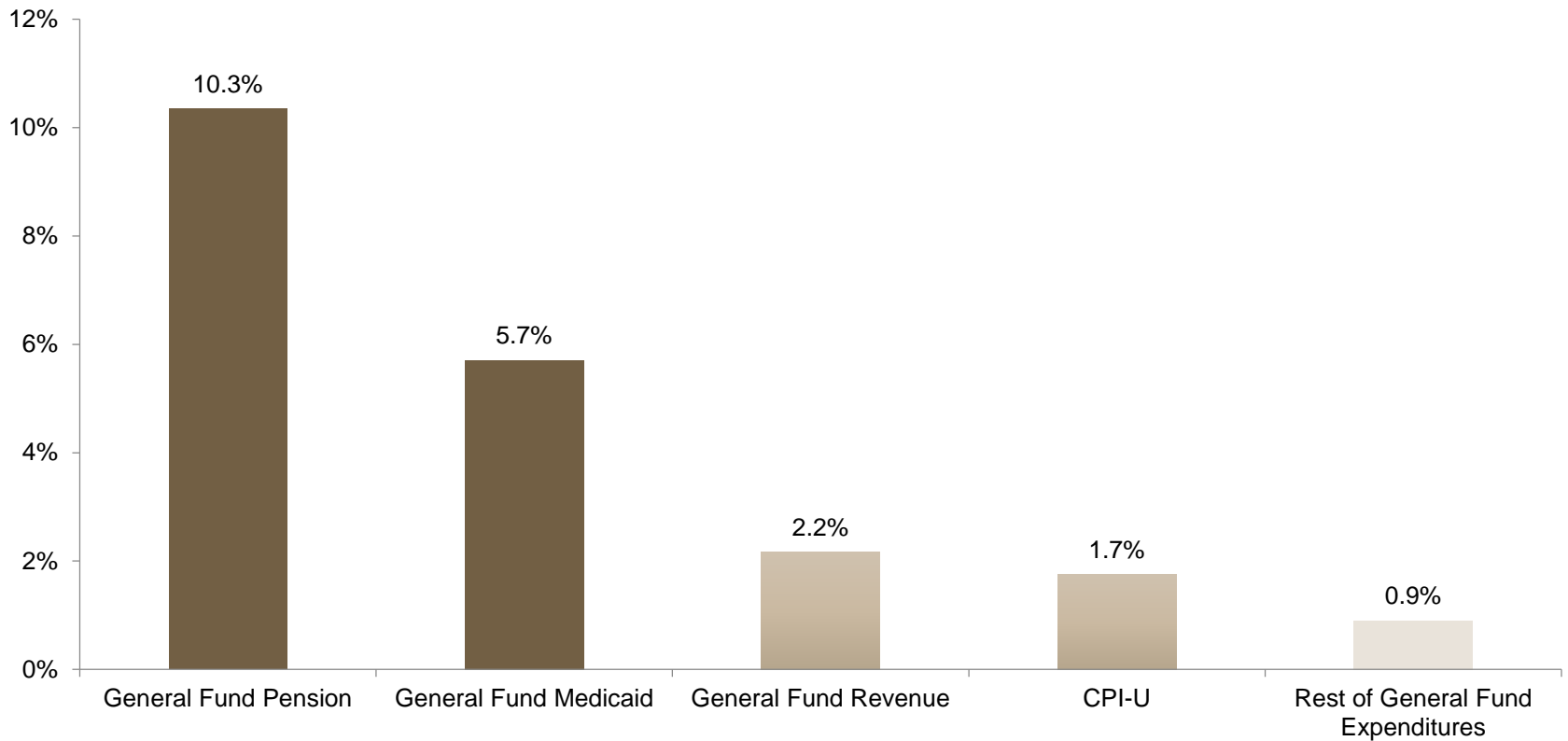KERS-NH and TRS Budget Contributions and Funded Ratio

Source: Commonwealth of Kentucky valuation reports for KRS, TRS as of 6/30/16, and Kentucky Office of the State Budget Director data. FY17 funded ratio from Cavanaugh MacDonald data based on the projections and assumptions of the 6/30/16 valuations. FY11 figure includes pension obligation bond proceeds for TRS.

Pension Expenditures are Crowding out the Rest of the Budget and Growing Much Faster than Revenues

**Pension Expenditures: Rapid Growth
FY07-FY17 Compound Annual Growth Rate**

Category	Growth Rate
General Fund Pension	10.3%
General Fund Medicaid	5.7%
General Fund Revenue	2.2%
CPI-U	1.7%
Rest of General Fund Expenditures	0.9%

Source: PFM analysis of Kentucky Office of the State Budget Director data

Pension Expenditures Are Also High Relative to Salaries

Actuarially Determined Contribution for Pensions by Plan
June 30, 2015 Actuarial Valuation Recommended Rate

ADC as % of Payroll

PPD Median: 18.6%

Plans: KERS-NH, KERS-H, CERS-NH, CERS-H, SPRS, KJRP - Old Plan, KJRP - New Plan, KLRP - Old Plan, KLRP - New Plan, TRS
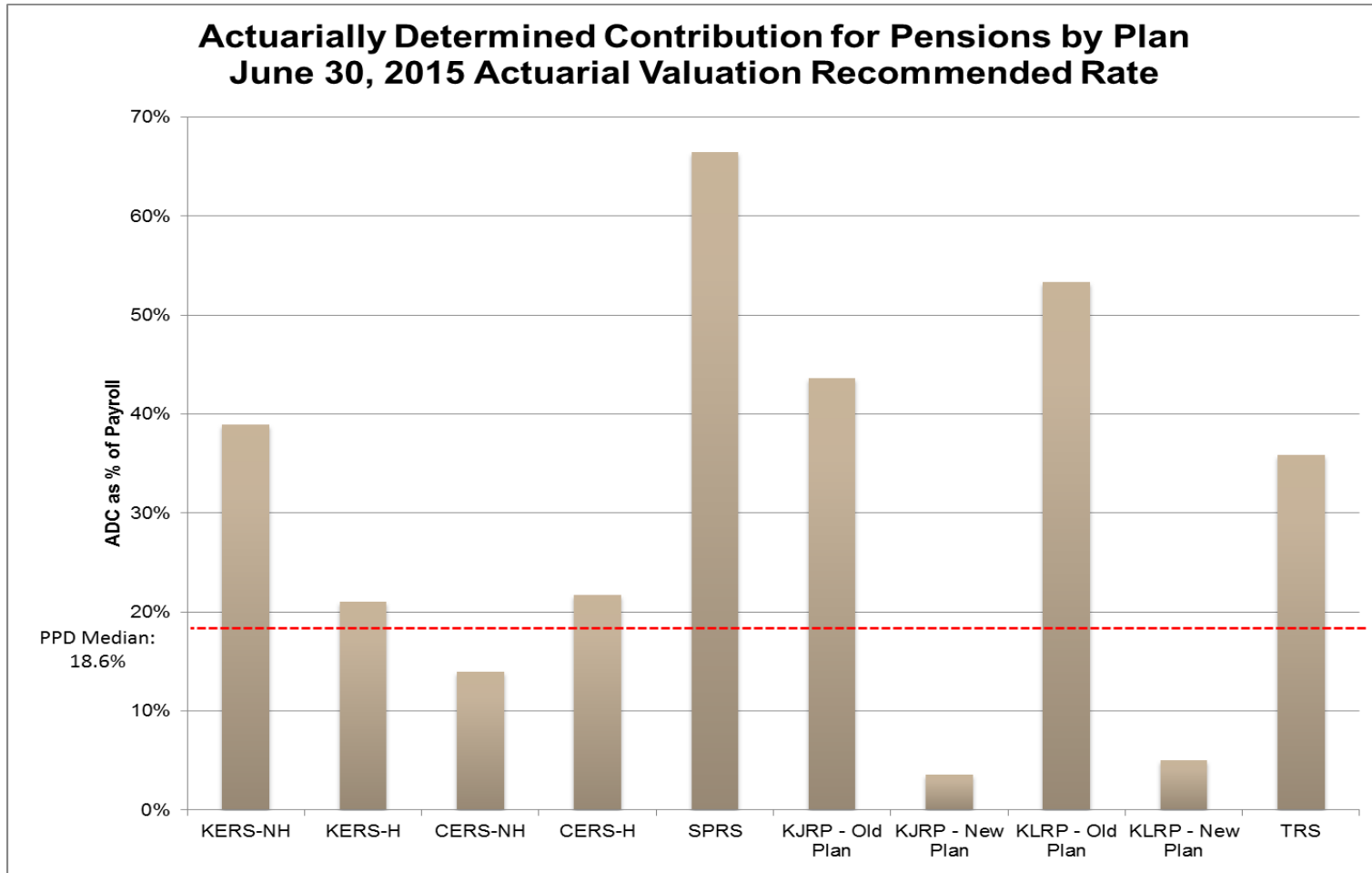
Source: System valuation reports, Center for Retirement Research: The Funding of State and Local Pensions, 2015- 2020, June 2016

KERS-NH Was Projected to Decline Still Further from 16% Funded Under the Previous Assumptions, Even With Healthy Earnings, High Payroll Growth and Full Required Funding

	Comparison of Pension Amortization Schedules KERS-NH June 30, 2016 Valuation and Actuarial Assumptions Level % of Payroll (Current Baseline Amortization Method as Defined in 2013SB2 vs. Level $ Amortization ($ in Millions)					
Year	**Employer Contribution**		**Unfunded Liability**		**Funded Ratio**	
	Level %	Level $	Level %	Level $	Level %	Level $
2019	$731.7	$1,082.2	$11,620	$11,258	12.9%	15.6%
2020	752.6	1,113.1	11,741	10,982	12.2%	17.9%
2021	793.3	1,117.3	11,789	10,643	12.0%	20.5%
2022	817.6	1,151.5	11,814	10,245	11.9%	23.6%
2023	851.9	1,099.4	11,805	9,875	12.1%	26.5%
2024	879.0	1,134.5	11,767	9,443	12.4%	29.7%
2025	912.1	1,071.0	11,692	9,047	13.0%	32.7%
2026	942.7	1,106.9	11,581	8,588	13.8%	36.1%
2027	976.7	1,040.2	11,428	8,166	14.9%	39.2%
2028	1,010.4	1,076.1	11,229	7,680	16.3%	42.7%
2029	1,044.0	1,005.8	10,983	7,234	18.0%	46.0%
2030	1,080.6	1,041.0	10,683	6,721	20.1%	49.7%
2031	1,114.8	968.8	10,327	6,249	22.5%	53.1%
2032	1,154.6	1,003.4	9,907	5,710	25.5%	57.0%
2033	$1,190.7	$929.8	$9,422	$5,211	28.9%	60.7%

Source: Cavanaugh MacDonald

Note: Actuarial assumptions include 6.75% earnings assumption, 4% payroll growth, and 26-year remaining amortization period.

Alternative Assumptions Increase General Fund Pressures

| Year	Commonwealth of Kentucky General Fund Budget Estimates TRS and KERS-NH Budget Estimates Baseline June 30, 2016 Valuation and Alternative Assumptions ($ in Millions)					
	TRS			KERS-NH		
	Published Actuarial Assumptions	Published Actuarial Assumptions with Level $ Amortization	Revised Asset Allocation Discount Rate (6%), Level % Amortization	Published Actuarial Assumptions	Published Actuarial Assumptions with Level $ Amortization	Revised Asset Allocation Discount Rate (5.1%), 0% Payroll Growth
2019	$1,056.8	$1,392.4	$1,407.7	$377.8	$558.8	$622.2
2020	1,071.0	1,403.6	1,454.5	388.6	574.7	640.0
2021	1,116.3	1,454.7	1,526.9	409.6	576.9	639.9
2022	1,185.3	1,501.4	1,596.8	422.2	594.5	659.5
2023	1,251.5	1,540.1	1,661.2	439.9	567.7	628.3
2024	1,296.2	1,546.2	1,703.1	453.9	585.8	648.3
2025	1,341.5	1,548.3	1,745.4	471.0	553.0	611.5
2026	1,386.5	1,546.8	1,786.8	486.8	571.6	632.0
2027	1,432.5	1,544.7	1,828.2	504.3	537.1	593.5
2028	1,479.7	1,542.2	1,870.5	521.7	555.6	614.0
2029	1,529.8	1,540.0	1,915.1	539.1	519.3	573.2
2030	1,582.1	1,538.0	1,961.4	557.9	537.5	593.3
2031	1,636.5	1,536.4	2,009.1	575.6	500.2	551.0
2032	1,692.4	1,534.6	2,058.0	596.2	518.1	570.7
2033	$1,751.3	$1,533.7	$2,108.4	$614.8	$480.1	$527.4

Source: PFM analysis based on information from the Kentucky Office of the State Budget Director and employer contribution estimates from Cavanaugh MacDonald.

Note: Budget amount based on the actuarially determined contribution under each scenario, not reflective of prior under- or over-funding. The TRS Revised Discount Rate estimates also reflect reduction of the payroll growth assumption to 2.5%.

Kentucky's OPEB (Retiree Healthcare) Liabilities are Relatively Better-Funded

Unfunded OPEB Liability per Capita
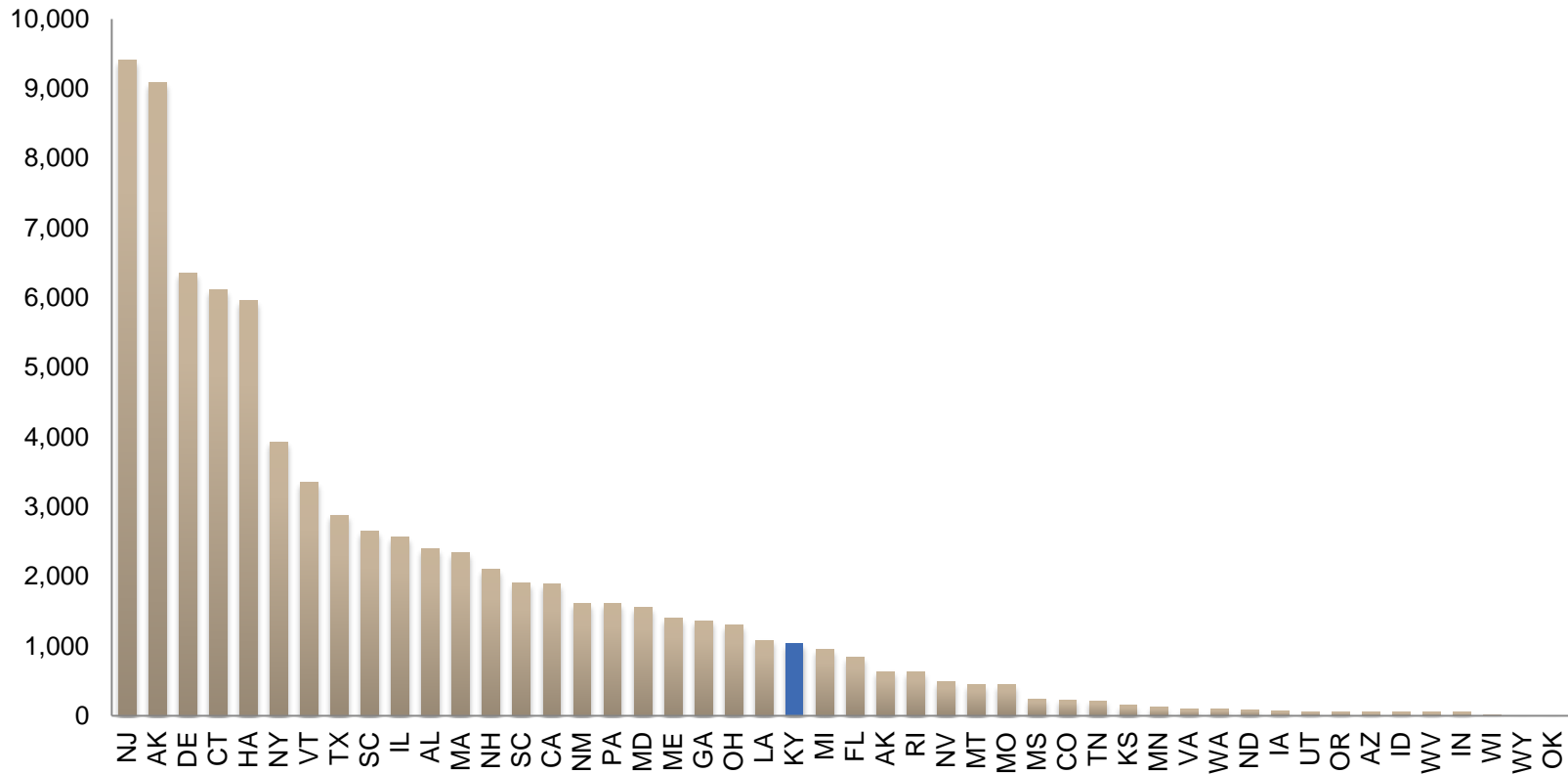
Source: Standard & Poor's, Rising U.S. State Post-Employment Benefit Liabilities Signal An Unsustainable Trend, September 7 2016. Note: Nebraska and South Dakota have no OPEB liability. Liabilities are as reported for the most recent valuation date available, between 12/31/2013 and 6/30/2015.

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Kentucky has Done More to Fund OPEB and Limit Liability than Most Other States
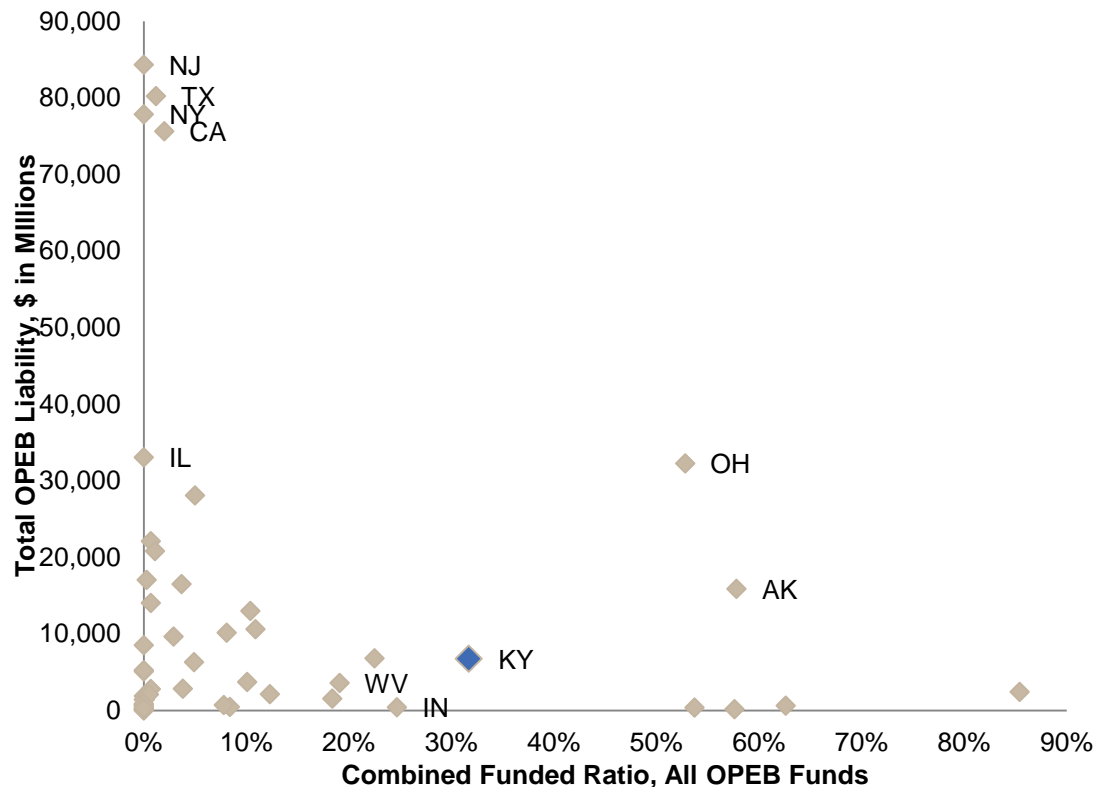
- While still a part of the overall challenge, Kentucky is better positioned with funding its OPEB liability
  - Set aside dedicated funding earlier than most other states
  - Employees contribute toward future benefits
  - $6 billion in unfunded liability is much lower than for pensions
- Benefit reforms
  - KRS in 2003
  - TRS in 2010

Total OPEB Liability v. OPEB Funded Ratio

Source: Standard & Poor's, Rising U.S. State Post-Employment Benefit Liabilities Signal An Unsustainable Trend, September 7 2016. Note: Nebraska and South Dakota have no OPEB liability. Liabilities are as reported for the most recent valuation date available, between 12/31/2013 and 6/30/2015.
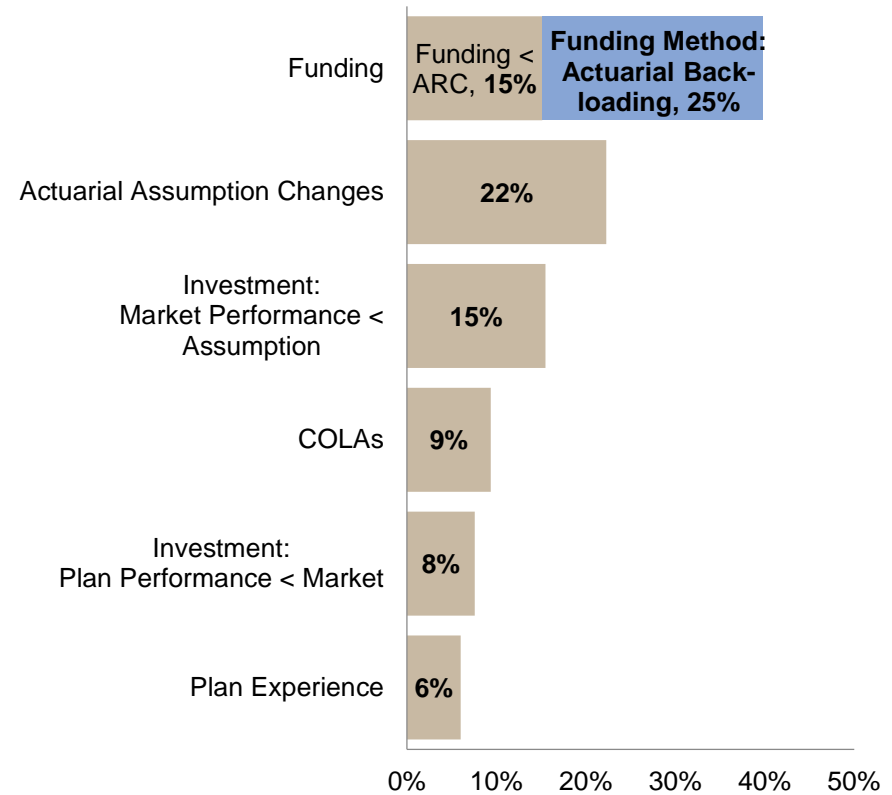
How Did We Get Here

How Did We Get Here: Summary

- Across all state systems in the aggregate, the largest cause of the increase in the unfunded pension liability was the use of the level percentage of payroll funding method ("actuarial back-loading" with "negative amortization") – amplified by pay increase assumptions far higher than actual pay increases over this 11-year time period
  - A further contributing factor is Kentucky's biennial budget. The County plans reset their contribution rates annually, whereas the State plans reset their contribution rates every second year
- The next two largest factors were:
  - Changes in actuarial assumptions
  - Market investment performance, measured by a benchmark portfolio being below the assumed valuation earnings rate
  - These two factors are related, as the decision to reduce the valuation earnings rate reflected the lower actual and reduced future investment earnings expectations
- The fourth major cause was employer funding less than the actuarially recommended rates
  - An issue for three of the six plans – and was a major cause of the increase for the KERS Non-Hazardous plan
- The fifth major cause was cost-of-living adjustments (COLAs) granted with no additional funding provided

Summary Components of $25.3 Billion Increase in Unfunded Pension Liabilities: All Systems

Category	Value
Funding	Funding < ARC, **15%** / **Funding Method: Actuarial Back-loading, 25%**
Actuarial Assumption Changes	**22%**
Investment: Market Performance < Assumption	**15%**
COLAs	**9%**
Investment: Plan Performance < Market	**8%**
Plan Experience	**6%**

0% 10% 20% 30% 40% 50%

Source: PRM Consulting Group
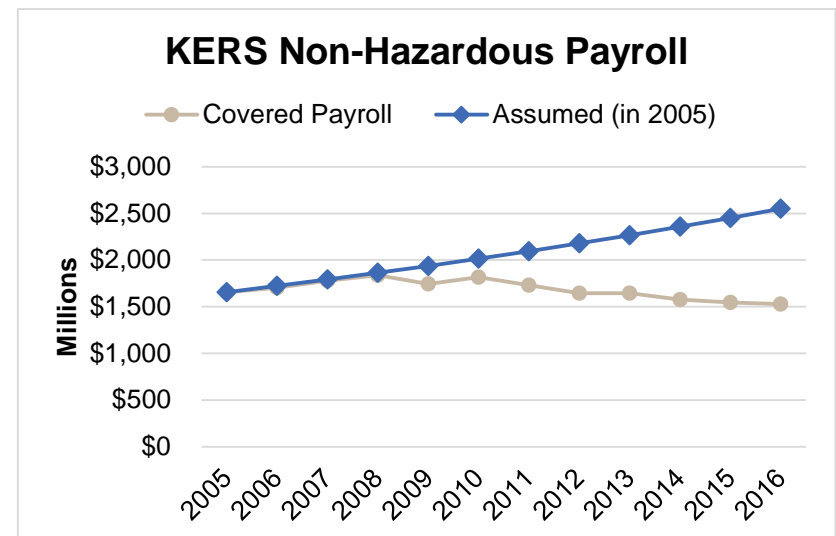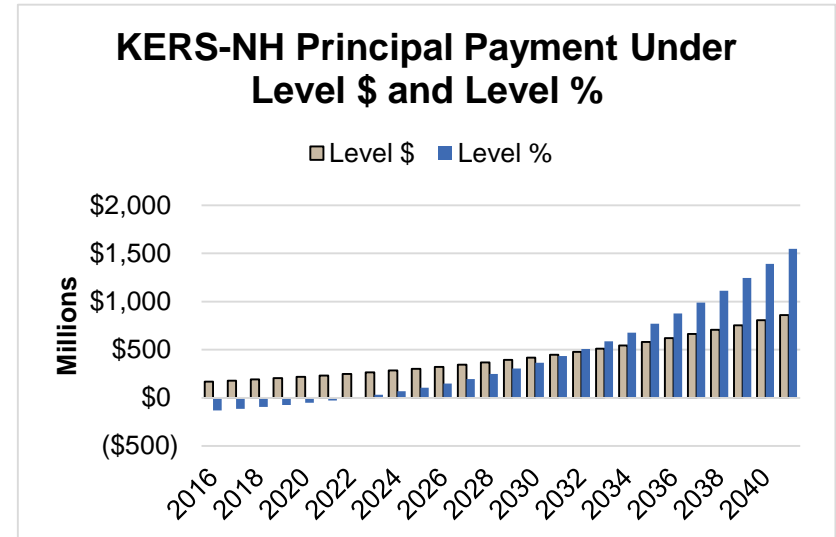
How Did We Get Here: Summary by System

- The actuarial back-loading and amortization method were a significant factor in the increase in unfunded liability for all the systems
- Changes in actuarial assumptions to reduce the discount rate, update mortality tables, and reflect demographic patterns was also a consistently large factor
- The CERS-H and SPRS plans had relatively significant unfavorable plan experience
- Sub-par market performance was a larger factor than individual plan management underperformance for most systems

Factors Increasing the Unfunded Pension Liability 6/30/2005 to 6/30/2016: Amounts in $Millions									
Causes	TRS	KERS-NH	KERS-H	CERS-NH	CERS-H	SPRS	KJRP	KLRP	TOTAL	
Actuarial Back-loading	$3,278	$1,153	$89	$1,269	$353	$111	$31	$2	$6,286	25%
Actuarial Assumption Changes	1,958	2,319	82	984	249	50	25	5	5,672	22%
Plan Experience	232	539	39	372	107	107	43	2	1,441	6%
Investment: Market Performance Below Assumption	1,926	639	80	931	297	45	5	2	3,925	15%
Investment: Plan Performance Below Market	1,014	610	(5)	207	82	8	14	0	1,930	8%
Funding Less Than the ARC	1,588	2,561	(10)	(220)	(133)	42	(11)	3	3,820	15%
COLAs	0	1,291	68	672	267	72	27	3	2,400	9%
	$9,996	$9,112	$343	$4,215	$1,222	$435	$133	$17	$25,473	100%

Source: PRM Consulting Group

Actuarial Back-loading Illustrated

- The level percent of payroll method used by Kentucky's systems assumes funding contributions grow along with payroll. Principal payments are allocated heavily to the end of the amortization period. In the early years of the period, payments may not be large enough to offset interest on the unfunded liability, creating "negative amortization"

- The KERS-NH amortization period was also reset to 30 years in 2013, and the TRS period was reset every year until 2014. When the period is reset, payments do not progress to paying down the unfunded liability

- Additionally, if payroll does not grow as assumed, then payments do not progress to pay down the unfunded liability. KERS-NH actuarial valuations assumed between 3.5% and 4.5% annual growth since 2005, yet covered payroll declined by a compound annual average of 1.1%

KERS-NH Principal Payment Under Level $ and Level %

Legend: ☐ Level $ ■ Level %

(Bar chart, Millions on y-axis ranging from ($500) to $2,000; x-axis years 2016 through 2040)

KERS Non-Hazardous Payroll

Legend: ●— Covered Payroll   ◆— Assumed (in 2005)

(Line chart, Millions on y-axis ranging from $0 to $3,000; x-axis years 2005 through 2016)

How Did We Get Here: KERS-NH

- Underfunding the ARC was the largest factor in the increase in unfunded liability for KERS-NH from 2005 to 2016

- Changes in actuarial assumptions, mainly reduction in the discount rate from 8.25% to 6.75% to reflect experience and future expectations, represented the second-largest factor

- The authorization of ad hoc COLAs that were not actuarially funded was also a significant cause of the increase

Major Category	KERS-NH - Causes of Growth in Unfunded Liability	Amount
Funding	Appropriation was less than the Actuarially Recommended Contribution (ARC)	$2,561
Actuarial	Actuarial Back-loading	1,153
Investment	Investment performance was less than market performance	610
Investment	Market performance was less than the valuation interest rate	639
COLA	COLAs granted without any additional funding	1,291
Actuarial	Actuarial assumption changes	2,319
Actuarial	Plan experience different from assumptions	539
	Total	$9,112

Source: PRM Consulting Group

How Did We Get Here: CERS-NH

- Actuarial back-loading was the biggest factor in the increase in the CERS-NH unfunded liability from 2005 to 2016
  - Employer participants actually funded more than the ARC over the time period, but the ARC itself was insufficient
- Changes in actuarial assumptions represented the second-largest factor
- The authorization of ad hoc COLAs that were not actuarially funded was also a significant factor

| Major Category	CERS-NH - Causes of Growth in Unfunded Liability	Amount
Funding	Appropriation was less (more) than the Actuarially Recommended Contribution (ARC)	($220)
Actuarial	Actuarial Back-loading	1,269
Investment	Investment performance was less than market performance	207
Investment	Market performance was less than the valuation interest rate	931
COLA	COLAs granted without any additional funding	672
Actuarial	Actuarial assumption changes	984
Actuarial	Plan experience different from assumptions	372
	Total	**$4,215**

Source: PRM Consulting Group

CERS-NH Actuarial Back-loading

- In each of the 11 years, the interest on the unfunded liability for CERS-NH exceeded the ARC amortization payment. Over the 11-year period the aggregate amount was $1.3 billion

- In FY2006, the employer contribution was also less than the employer Normal Cost

**CERS-NH Amortization Payment Amounts
Less Than Interest on the Unfunded Liability**

■ ARC Amortization Payment   ■ Interest on Unfunded Liability
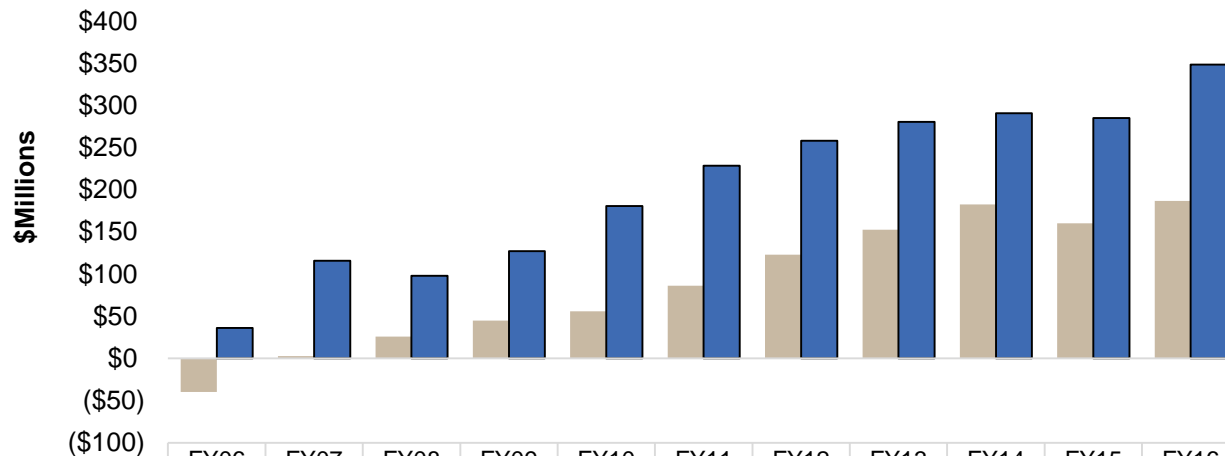
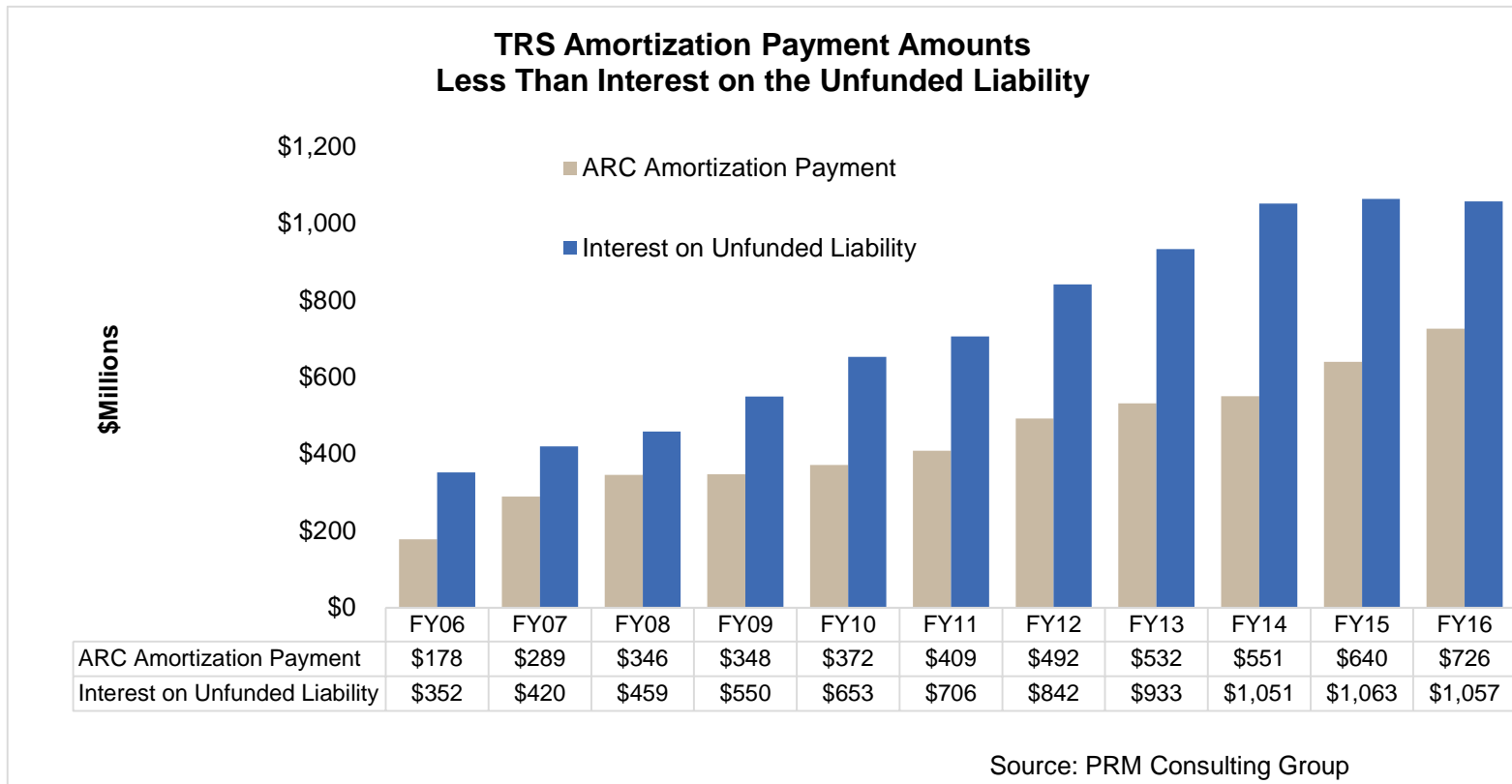|	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16
ARC Amortization Payment	($40)	$3	$26	$45	$56	$86	$123	$153	$183	$161	$187
Interest on Unfunded Liability	$36	$116	$98	$127	$181	$229	$258	$281	$291	$285	$349

How Did We Get Here: TRS

- Actuarial back-loading, attributable in part to the open/rolling amortization period that was annually reset until 2014, was the biggest factor in the TRS increase in unfunded liability

- While underfunding of the ARC was also a meaningful factor, actuarial back-loading, changes in assumptions, and investment performance compared to the 7.5% discount rate were all larger causes of increase in the unfunded liability between 2005 and 2016

| Major Category	TRS - Causes of Increase in Unfunded Liability	Amount
Funding	Appropriation was less than the Actuarially Recommended Contribution (ARC)	$1,588
Actuarial	Actuarial Back-loading	3,278
Investment	Investment performance was less (more) than market performance	1,014
Investment	Market performance was less than the valuation interest rate	1,926
Actuarial	Actuarial assumption changes	1,958
Actuarial	Plan experience different from assumptions	232
	Total	$9,996

Source: PRM Consulting Group

TRS Actuarial Back-loading

◆ The ARC has been underfunded for the Teachers' Retirement System since FY2004, however, even full ARC funding would have been insufficient to keep the unfunded liability from growing, due to the level percent of payroll amortization and past rolling amortization periods

**TRS Amortization Payment Amounts
Less Than Interest on the Unfunded Liability**

■ ARC Amortization Payment

■ Interest on Unfunded Liability

$Millions

	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16
ARC Amortization Payment	$178	$289	$346	$348	$372	$409	$492	$532	$551	$640	$726
Interest on Unfunded Liability	$352	$420	$459	$550	$653	$706	$842	$933	$1,051	$1,063	$1,057

Source: PRM Consulting Group

TRS Investment Returns

- Although TRS returns have been better than KRS returns over the past 5- and 10-year periods, investment performance contributed more to the increase in unfunded liability for TRS in dollar terms than for KERS-NH:

  - TRS has a larger asset base; as a result, underperforming the valuation assumption by 1% will have a greater $ impact

  - TRS has not reduced its 7.5% discount rate assumption, while KRS has done so multiple times (reflected in the KRS "actuarial assumption changes" category rather than investment returns)

TRS Investment Performance

Legend: ■ Actual (AVA) ■ Benchmark (Market) ■ Valuation Rate

Average values: 7.5%, 5.8%, 5.6%
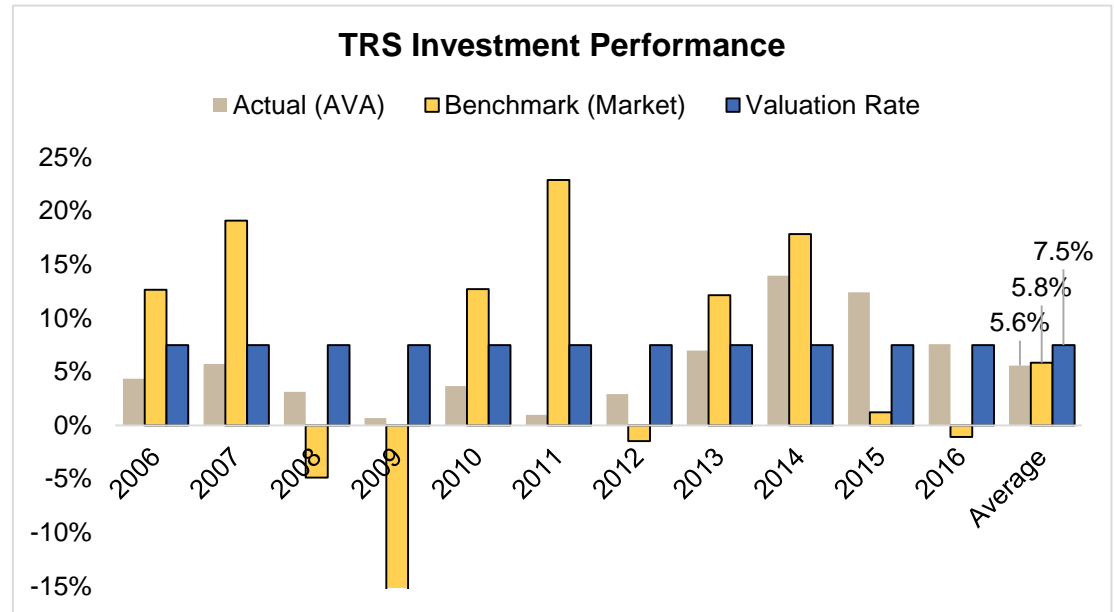
Source: PRM Consulting Group

Cash Flows and Solvency Analysis

Kentucky Systems Reported an Aggregate $7 Billion Negative Cash Flow from FY2006-FY2016

- The KRS and TRS systems had significant recurring negative cash flows from FY2006-FY2016
  - The accounting definition of cash flows excludes investment earnings
- Only the CERS-H plan had positive cash flow over the period
- KERS-NH and TRS had to routinely liquidate assets over the time period in order to pay benefits

Total Kentucky Pension Fund Cash Flows FY2006-FY2016 Inflows + Interest/Dividends – Outflows ($ in 000s)			
Fund	**Inflows**	**Outflows**	**Cash Flow**
KERS-NH	$4,792,048	$9,061,781	$(4,269,733)
KERS-H	477,393	502,187	(24,794)
SPRS	304,008	512,277	(208,269)
CERS-NH	5,428,274	5,744,284	(316,010)
CERS-H	1,942,982	1,780,890	162,092
TRS	13,612,859	15,866,112	(2,253,253)
Total	$26,557,564	$33,467,531	$(6,909,967)

Source: KRS, TRS financial statements

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The Most Stressed Systems had Declining Assets

- KERS-NH and SPRS had a decline in net position (net assets) from FY2006 to FY2016

- Although the net position of TRS and CERS-NH increased in total, each had declines in net position in five of the years

- The increases in net position for KERS-H, CERS-NH, CERS-H, and TRS were significantly smaller than the offsetting increases in liabilities

Total Kentucky Pension Fund Changes in Plan Assets, FY2006-FY2016 Net Increase/ (Decrease) in Plan Assets ($ in 000s)			
Fund	**Additions**	**Deductions**	**Changes in Net Position**
KERS-NH	$5,692,406	$9,061,781	$(3,369,375)
KERS-H	634,015	502,187	131,828
SPRS	391,520	512,277	(120,757)
CERS-NH	7,031,777	5,744,284	1,287,493
CERS-H	2,389,874	1,780,890	608,984
TRS	19,232,030	15,866,112	3,365,918
Total	$35,371,622	$33,467,531	$1,904,091

Source: KRS, TRS financial statements

Negative Cash Flows Projected to Continue at KERS-NH

● Based on the assumptions, contribution requirements, and amortization schedule of the June 30, 2016 KERS-NH valuation, negative cash flows are projected to continue until benefit payments begin to level off while the amortization schedule continues to increase

KERS-NH Pension Fund Projected Cash Flows Based on June 30, 2016 Valuation and Assumptions: 6.75% Earnings, 4% Payroll Growth Annually Inflows - Outflows ($ in 000s)			
Year	Inflows	Outflows	Cash Flow
FY16	614,761	946,407	(331,646)
FY17	740,104	970,194	(230,090)
FY18	756,955	980,487	(223,532)
FY19	817,653	991,093	(173,440)
FY20	840,985	1,000,951	(159,966)
FY21	884,308	1,010,891	(126,583)
FY22	911,371	1,021,291	(109,920)
FY23	948,591	1,031,667	(83,076)
FY24	978,803	1,041,248	(62,445)
FY25	1,015,157	1,050,188	(35,031)
FY26	1,049,221	1,058,845	(9,624)

Source: Cavanaugh MacDonald
Note: does not include dividends/interest or other investment earnings

Negative Cash Flows Projected to Continue at TRS

- TRS is also projected to experience negative annual cash flows based on the assumptions, contribution requirements, and amortization schedule of the June 30, 2016 valuation, even if the 7.5% earnings assumption is met annually and the full Actuarially Determined Contribution (ADC) is made annually for the first time since FY2004

- It is not uncommon for a mature system with a high level of retirees to actives to operate with negative cash flows and rely on investment earnings to offset changes in net position

  - The recurring negative cash flows of the magnitude projected for TRS indicate the level of risk and stress associated with a plan that is 55% funded. The negative cash flow would be greater in years where:

    o The earnings assumption is not met

    o Payroll growth is lower than assumed

    o Authorized funding levels are lower than the ADC

TRS Pension Fund Projected Cash Flows Based on June 30, 2016 Valuation and Assumptions: 7.5% Earnings, 3.5% Payroll Growth Annually Inflows - Outflows ($ in 000s)			
Year	Inflows	Outflows	Cash Flow
FY16	878,499	1,841,835	(963,336)
FY17	1,364,932	1,964,173	(599,241)
FY18	1,380,628	2,054,888	(674,260)
FY19	1,446,733	2,127,401	(680,668)
FY20	1,469,823	2,200,779	(730,956)
FY21	1,525,999	2,273,937	(747,938)
FY22	1,607,509	2,373,992	(766,483)
FY23	1,686,030	2,429,201	(743,171)
FY24	1,742,259	2,507,931	(765,672)
FY25	1,799,455	2,590,340	(790,885)
FY26	1,856,506	2,674,843	(818,337)

Source: Cavanaugh MacDonald
Note: does not include dividends/interest or other investment earnings

Liabilities and the Discount Rate

● Public plans continue to use the expected long-term rate of return on investments to discount the value of future benefit payments to a present value liability figure (the discount rate). The size of the liability and annual funding requirement – the annual required contribution (ARC) prior to FY2015, or actuarially determined contribution (ADC) afterward – are sensitive to the discount rate and other actuarial and economic assumptions

● Private plans subject to the federal Employee Retirement Income Security Act ("ERISA") typically discount liabilities for reporting and funding based on high-quality corporate bond rates like the Corporate Bond Index. *"The bond-based approach is premised on the theory that pension benefits are 'bond-like,' in that they constitute promises to make specific payments in the future, and should be similarly valued."* (United States Government Accountability Office, Pension Plan Valuation: Views on Using Multiple Measures to Offer a More Complete Financial Picture, September 2014)

● Governmental Accounting Standards Board (GASB) Statements 67 and 68 issued in 2012 and recently implemented by state and local pension plans and plan sponsors adopted a hybrid of the traditional earnings-based assumption and a bond-based assumption for reporting, but not funding, purposes.

  • The Statements require the application of the long-term earnings rate on assets projected to cover future liabilities, and an index of 20-year government bond rates to any projected future shortfall. This "blended" rate is to be applied and reported only where the actual contributions have consistently been materially below the required contribution, and therefore assets are projected to be depleted

  • The FY2015 and FY2016 TRS and KJFRS reports used such a blended rate

Revised Asset Allocation Rates

- KRS is revising its asset allocation approach to reflect the varying degrees of stress and diminished assets of its plans

- Our report includes alternate return assumptions for a 10-year investment horizon and two levels of increased liquidity positions generally consistent with updated KRS policy, with up to an allocation of 25% short-term bonds and 25% cash for the highly stressed plans.

- These assumptions were based on PFM Asset Management's expected 10-year return for a portfolio with increased allocation to short-term bonds and cash. The time horizon for the investment return and the matching of asset investments to liabilities and the cash flows of paying benefits reflect the condition of the plans

	PFMAM 70/30 Model	Scenario 1	Scenario 2
Equity	**70.0%**	**35.0%**	**52.5%**
Domestic Equity	46.0%	23.0%	34.5%
International Developed Equity	16.5%	8.3%	12.5%
Emerging Markets Equity	7.5%	3.8%	5.5%
Fixed Income	**30.0%**	**65.0%**	**47.5%**
Core Fixed Income	22.0%	11.0%	16.5%
Investment Grade Corporate	2.0%	1.0%	1.5%
Emerging Markets Debt	2.0%	1.0%	1.5%
High Yield	2.0%	1.0%	1.5%
Bank Loans	2.0%	1.0%	1.5%
Short Bonds	0.0%	25.0%	13.0%
Cash	0.0%	25.0%	12.0%

| 10 Year Return Assumptions			
Expected Return	6.9%	5.1%	6.0%
Standard Deviation	11.6%	6.1%	8.8%
Probability of 5.0% Return	68.1%	51.2%	62.3%
Probability of 5.5% Return	64.2%	41.8%	56.0%
Probability of 6.0% Return	58.8%	30.8%	49.6%
Probability of 6.5% Return	52.1%	22.5%	42.5%
Probability of 7.0% Return	50.5%	16.4%	36.0%
Probability of 7.5% Return	43.3%	11.5%	29.3%

Source: PFM Asset Management

Return assumptions for a 10-year investment horizon were derived by extrapolating from intermediate-term (5 year) and long-term (30 year) capital market assumptions. Please refer to PFMAM's 2017 Capital Market Assumptions for a complete description of the methodology used to develop these assumptions and important disclosures.

Solvency Analysis

- Given the at-risk funded position, contribution history, and cash flow and liquidity concerns of the major state plans, we tested the KERS-NH and TRS plans under several alternate assumptions and scenarios to identify whether the plans would be projected to remain solvent

- The additional amounts appropriated for KERS-NH have had a significant benefit. If future funding of KERS-NH reverted to the prior, pre-FY2016 patterns of funding roughly 60% of the ARC, assuming 0% payroll growth, the plan is projected to go insolvent within several years, even if the published actuarial return assumption is met
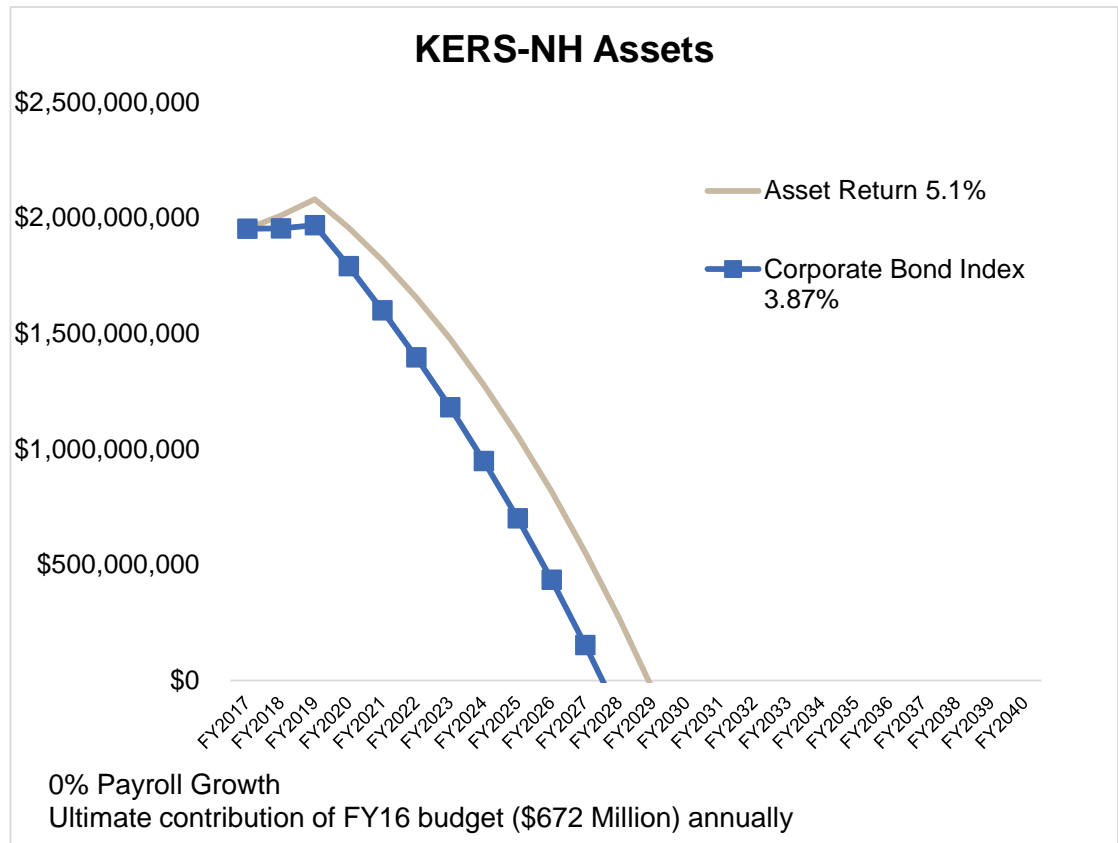
KERS-NH Assets

Revised Asset Allocation Return 5.1%

Corporate Bond Index 3.87%
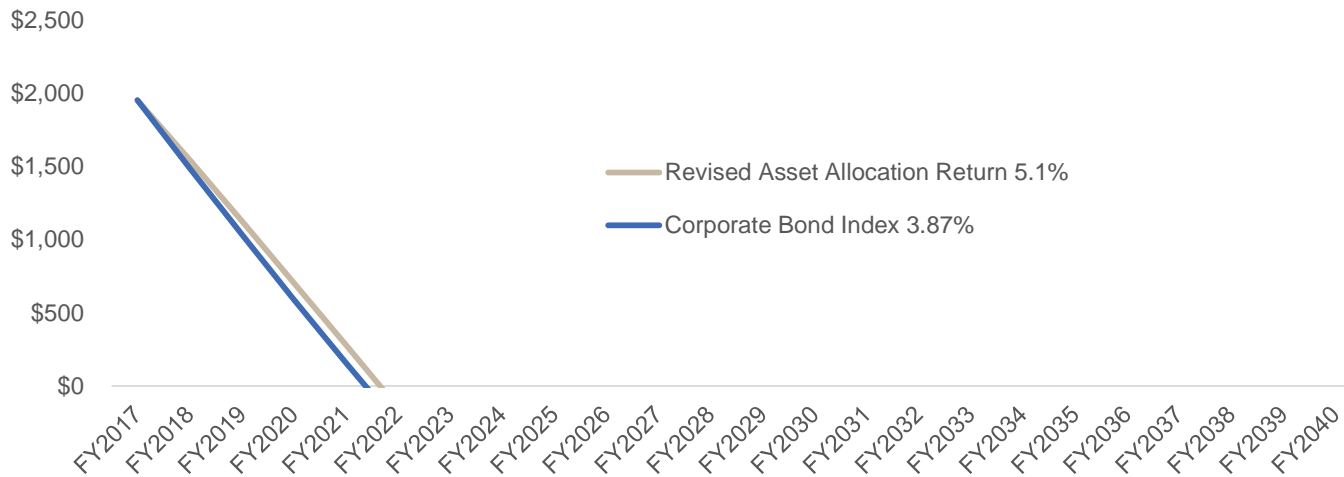
Source: PRM Consulting Group

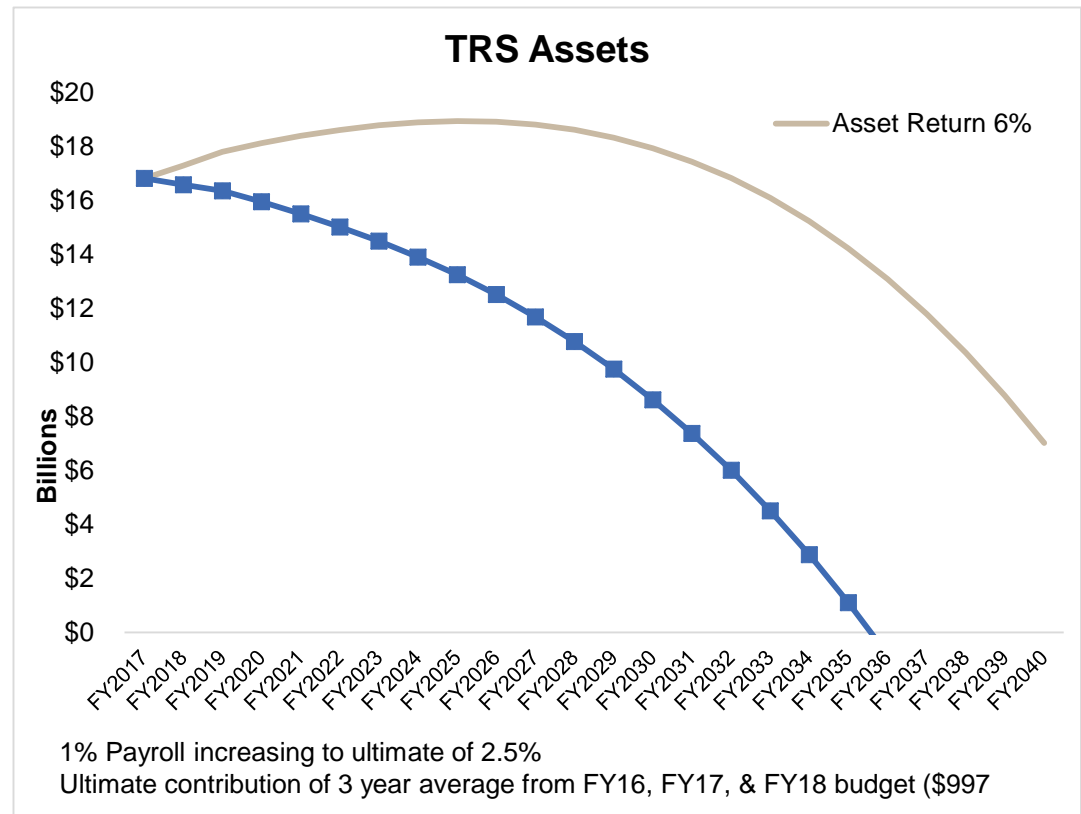# KERS-NH Faces Insolvency Without Elevated Funding Levels

- The amounts appropriated in the FY2017-2018 budget were significantly higher than the ADC. If these amounts were maintained and the Revised Asset Allocation or Corporate Bond Index rates are achieved ever year on average, the plan is projected to remain solvent, even with 0% payroll growth.

- The plan is projected to become insolvent:
  - By FY2022 if the employer contribution reverts to pre-FY17 levels
  - By FY2028 if employer contribution is maintained at FY2016 levels, payroll growth is 0%, and the Corporate Bond Index rate is earned, or FY2029 if the Revised Asset Allocation rate is earned
  - By FY2033 if employer contribution is maintained at the average of FY2016-FY2018 levels, payroll growth is 0%, and the Corporate Bond Index rate is earned, or FY2037 if the Revised Asset Allocation rate is earned (not shown)

KERS-NH Assets

Legend:
— Asset Return 5.1%
— ■ — Corporate Bond Index 3.87%

0% Payroll Growth
Ultimate contribution of FY16 budget ($672 Million) annually

TRS is More Stable but Also Pressured

- If the TRS recommended employer contribution levels are fully achieved in FY2019 and thereafter (which would be the first time since FY2004) <u>and</u> assets earn the Revised Asset Allocation return of 6.0% per year or higher, the plan is projected to remain solvent.

- The plan is projected to become insolvent, if:
  - The employer contribution reverts to pre-FY17 levels
  - The average of the FY2016-2018 budgeted amounts is maintained in future years, and payroll growth is initially a reduced 1% per year increasing to the actuarial assumption of 2.5% per year. If assets earn the Revised Asset Allocation return of 6.0% per year insolvency is estimated to occur in FY2044, while insolvency is estimated to occur in FY2036 if the plan earns the Corporate Bond Index rate
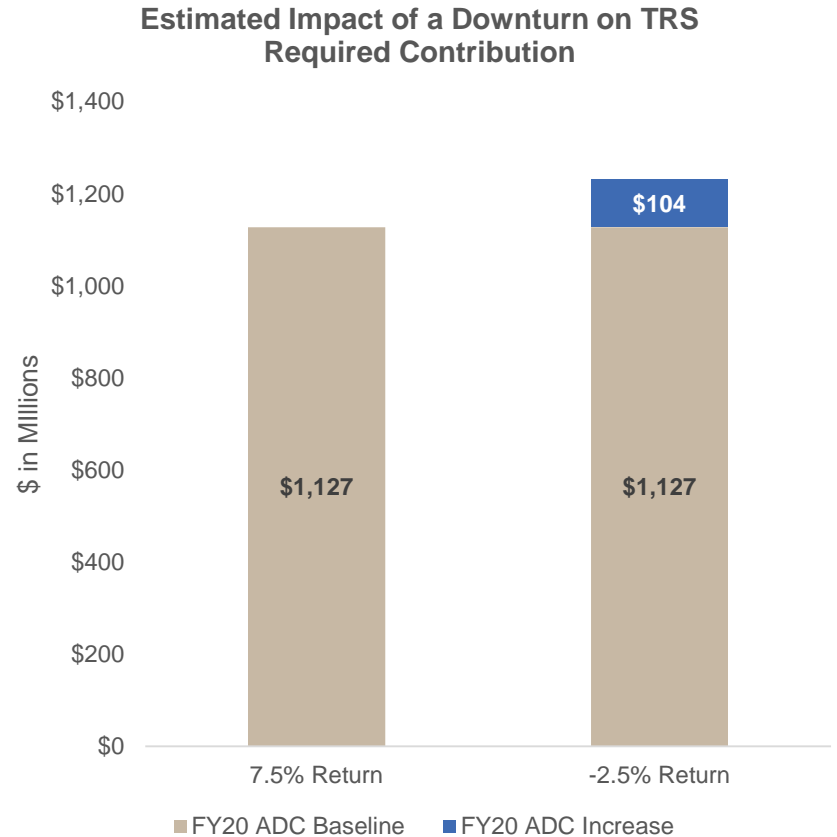
TRS Assets

1% Payroll increasing to ultimate of 2.5%
Ultimate contribution of 3 year average from FY16, FY17, & FY18 budget ($997

Source: PRM Consulting Group

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Market Downturns Would Increase Future Funding Requirements

- In addition to the solvency analysis scenarios, we modeled the impact of an immediate economic downturn on the ADC funding requirement

- The asset base of KERS-NH is now so low that deviations would not have a large, short-term impact on the contribution requirements or solvency

- A market return one standard deviation lower than the return assumption for TRS would result in a $104 million, or 9%, increase in the ADC after smoothing the losses

  - This corresponds to a -2.5% annual return compared to the 7.5% assumption

  - TRS returns were equal to or lower than this level in roughly 12% of the trailing 12-month return periods between July 2003 and June 2016

Estimated Impact of a Downturn on TRS Required Contribution

Chart: $ in Millions

	7.5% Return	-2.5% Return
FY20 ADC Increase		$104
FY20 ADC Baseline	$1,127	$1,127

Legend: ■ FY20 ADC Baseline ■ FY20 ADC Increase

Y-axis values: $0, $200, $400, $600, $800, $1,000, $1,200, $1,400

Source: PRM Consulting Group estimate based on Cavanaugh MacDonald 6/30/16 valuation data
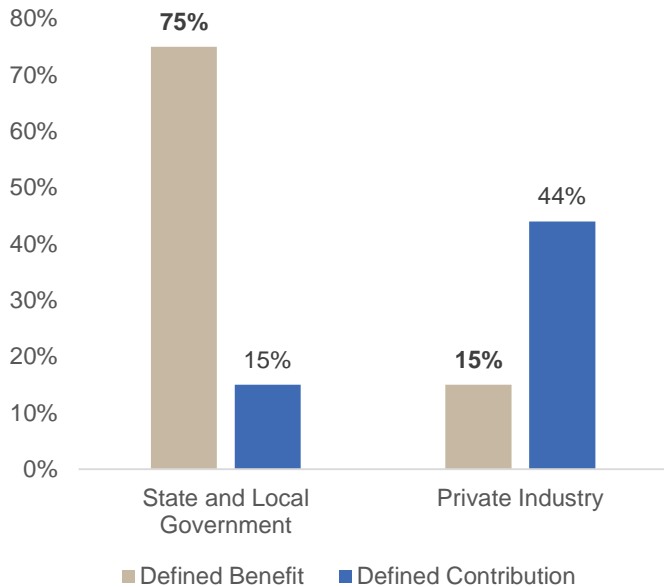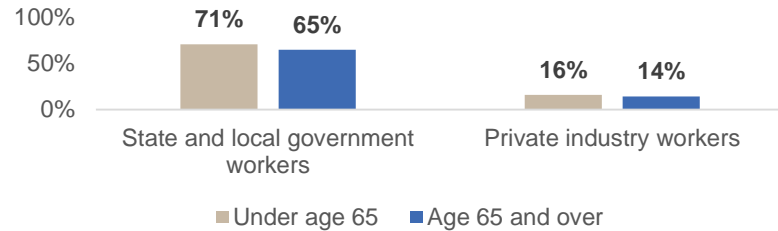
Benefits Benchmarking

Government Benefits Diverge from Private Sector Benefits Nationally and in Kentucky

Worker Participation in Pension Plans by Sector and Type
2016

Source: Bureau of Labor Statistics National Compensation Survey, March 2016

Access to Retiree Health Care Benefits, Private Sector and State and Local Government

Source: Bureau of Labor Statistics, National Compensation Survey, March 2012 (most recent available on this topic)

Compensation: Kentucky State Employees v. Comparable Private Sector Workers
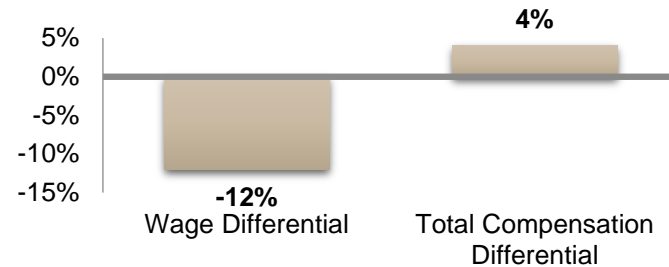
Source: American Enterprise Institute for Public Policy Research, April 2014

Benefit Benchmarking

- As part of our evaluation, we gathered information on past and current benefit provisions for the Kentucky Retirement Systems. This detailed information is contained in Appendix A of our full report

- We also collected information for 20 other state systems for civilians, state police, teachers, and judges in order to compare terms. This detailed information is contained in Appendix B. These states include the states contiguous to Kentucky, other states where teachers are not in the Social Security system, and other regional competitors or states with relevant benefit provisions, identified with input from Commonwealth leadership

- A sub-set of these states were reviewed to quantify the present value of the pension benefit for KERS-NH and TRS members in order to make a direct comparison of value that factors in the different elements of the benefit structure

States Surveyed for Pensions/OPEB	KY, CA, CO, FL, GA, IL, IN, IA, MA, MI, MO, NY, NC, OH, PA, SC, TN, TX, VA, WV, WI
Pension Plan Characteristics Surveyed	Plan Structure (DB, DC, Hybrid), Benefit Formula, Employee Contribution, Vesting, AFC Period, Normal Retirement Eligibility, Social Security Participation, and COLA
OPEB Plan Characteristics Surveyed	Plan Structure (DB, DC), Active Employee Contribution, Retire Premium Co-Share (Under 65/65 and Over), Employer Contribution (Under 65/65 and Over), Insurance Coverage, Eligibility, and Prescriptions

Summary of Plan Structures

- **State civilian plans:**
  - 15 DB plans for new hires, four hybrid DB/DC plans, and one DC plan
  - The KERS-NH employee contribution is at the median for plans reviewed
  - Eight states, like Kentucky, do not offer new hires traditional defined benefit retiree medical insurance with the majority of the premiums paid by the employer

- **State teacher plans:**
  - 17 DB plans for new hires, three hybrid DB/DC plans
  - The TRS employee contribution is below the median for the plans of states where teachers are not enrolled in Social Security
  - Nine states do not offer new hires traditional defined benefit retiree medical insurance with the majority of the premiums paid by the employer

The KERS-NH Tier 3 Cash Balance Plan Continues to Provide a Competitive Benefit

Non Hazardous General Employee
Retiree Age 62 with 30 Years of Service

Legend: ■ SS Employer ■ DB Employer ■ DC Employer ■ DB Employee ■ DC Employee ■ SS Employee — Average

Categories (x-axis): KY Tier 3, MO, OH, IL, TN, IN, VA, WV

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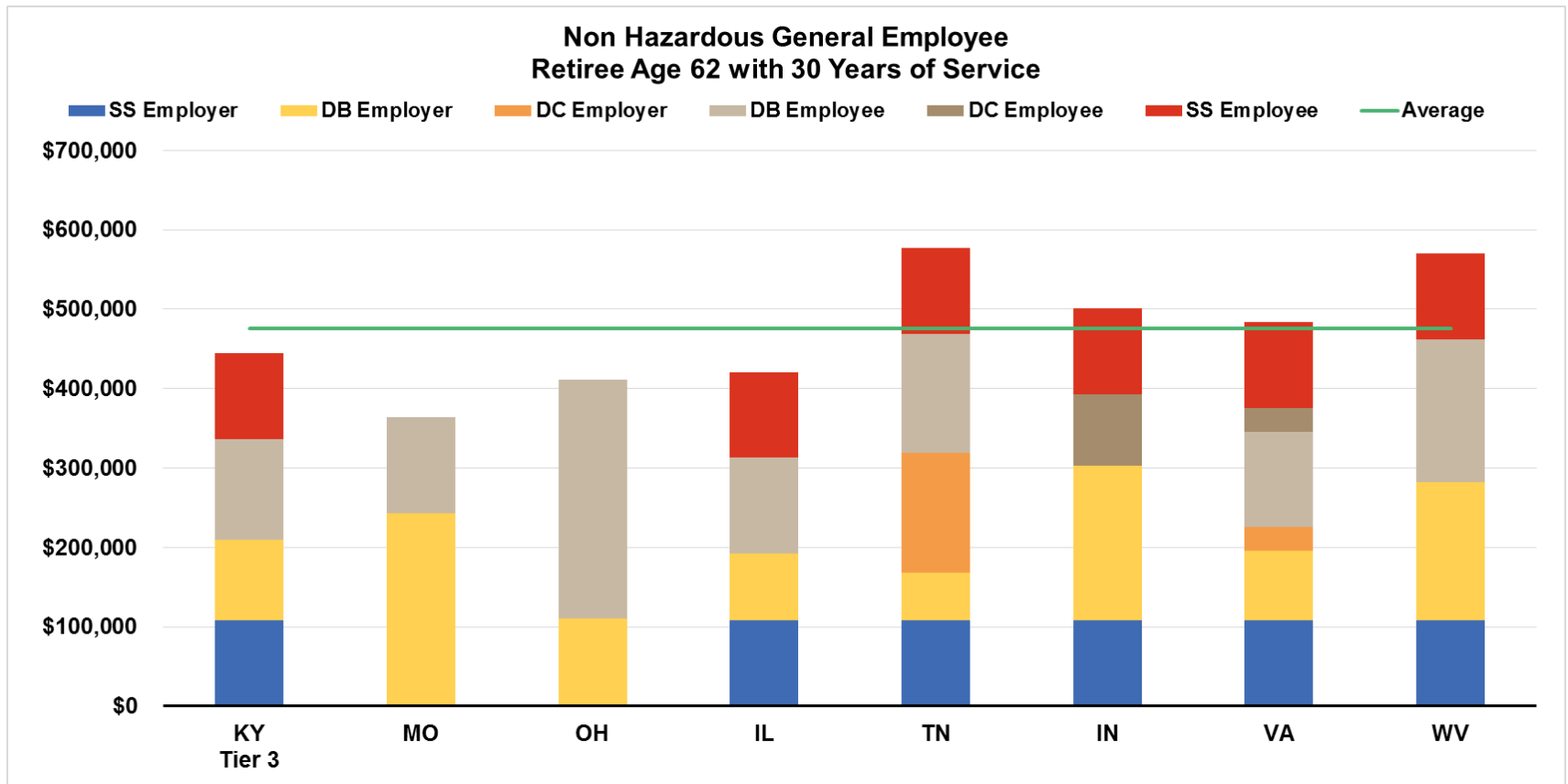
Current KERS-NH Employees in the Tier 1 Plan Receive an Above-Average Benefit and Favorable Retirement Eligibility

**Legacy Non-Hazardous General Employee
Retiree Age 55 with 27 Years of Service**

Legend: SS Employer | DB Employer | DC Employer | SS Employee | DB Employee | - - - - Average
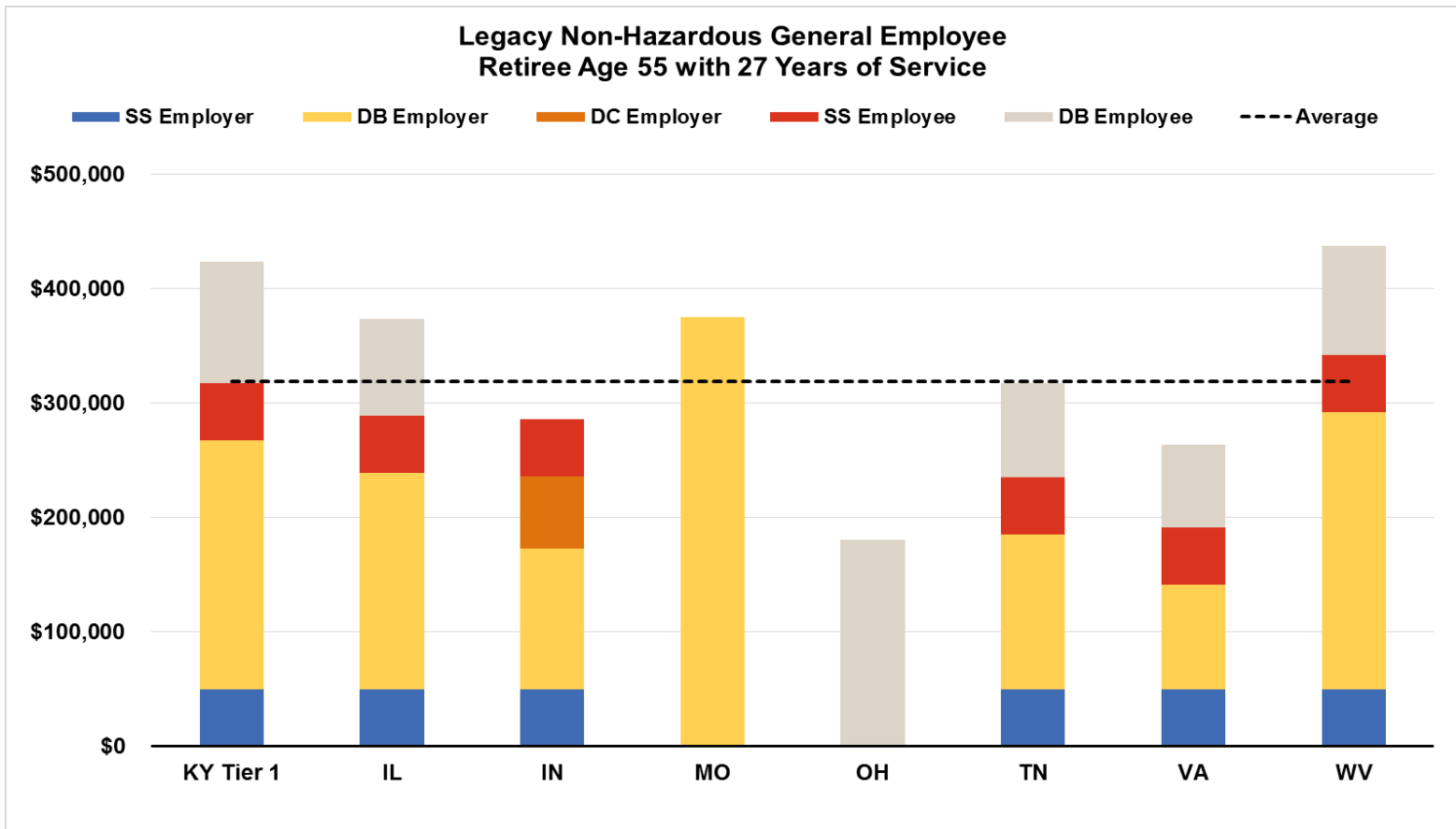
KRS Retiree Benefits have Higher Value than the Benefits Offered by the Largest Kentucky Private Sector Employers

Value of Benefit Accruals per Employee per Year Compared to Private Sector

■ Defined Contribution ■ Defined Benefit ■ Retiree Health

© PFM

Source: PRM Consulting Group
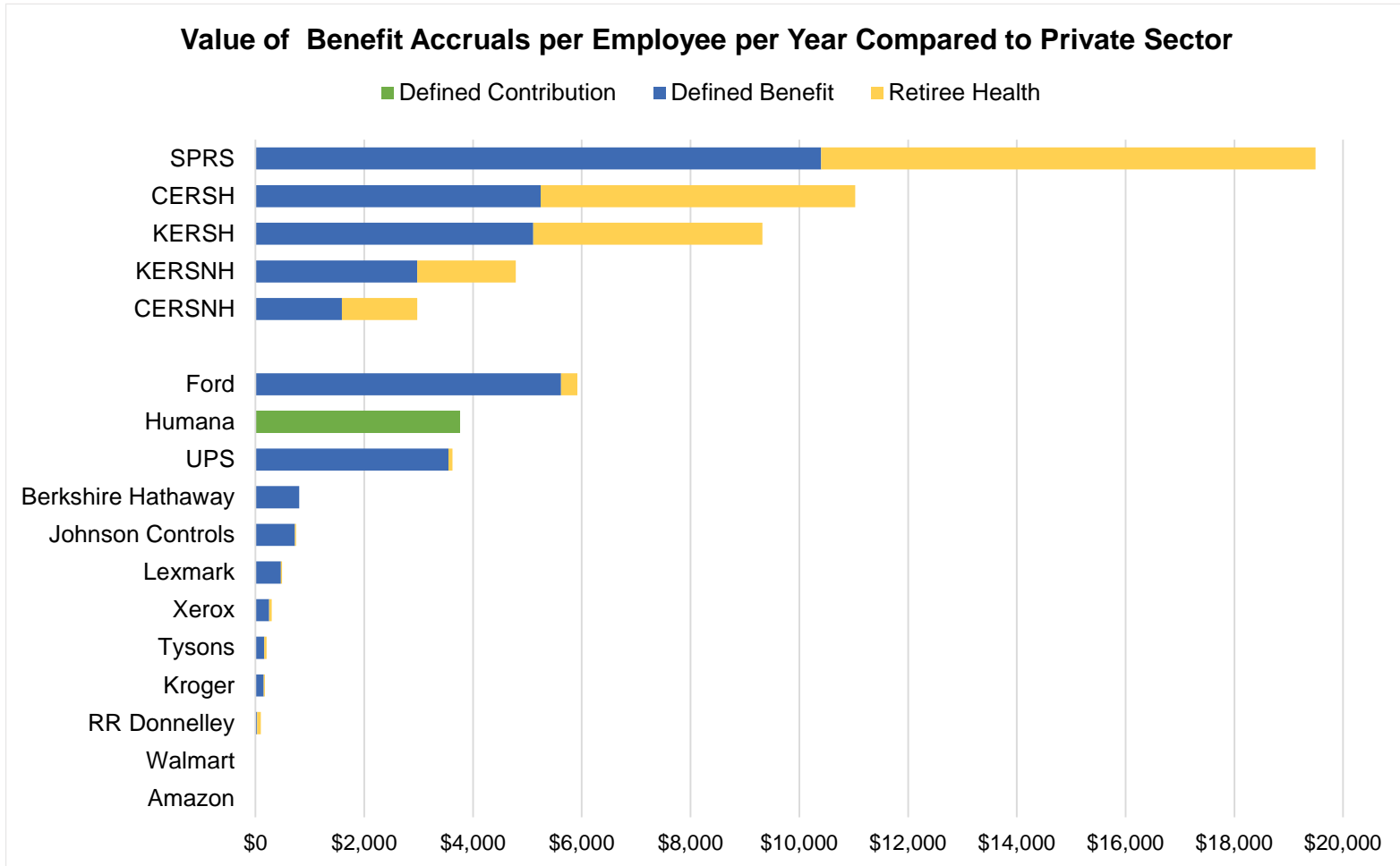
The TRS Plan Provides an Above-Average Benefit

- The current TRS plan provides an above-average benefit, particularly through the employer contribution and the relatively generous retirement eligibility provisions

- The Illinois and Ohio plans do not offer an unreduced benefit for retirement at age 62 with 30 years

- Kentucky teachers can retire at any age with 27 years of service, at age 60 with 5 years, and at age 55 with 5-10 years (depending on date of hire)

Teacher Retiree
Age 62 with 30 Years of Service

Legend: SS Employer | DB Employer | DC Employer | SS Employee | DC Employee | DB Employee | - - - Employee Average | - - - Employer Average
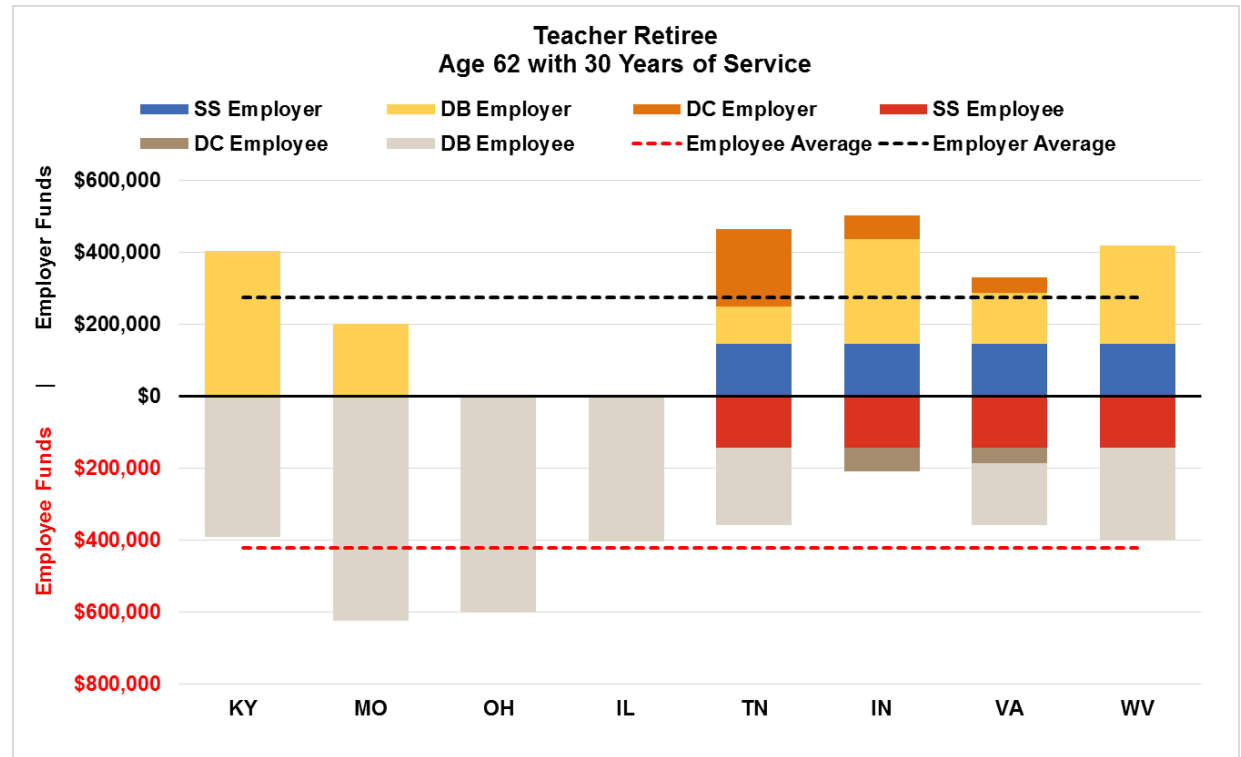
Kentucky Teachers Earn Full Benefits Early

Teachers Comparison of Earliest Retirement Ages (Unreduced Benefit) at Various Hire Ages

Retirement Age

Age at Hire: ■ 22 ■ 27

Source: PRM Consulting Group
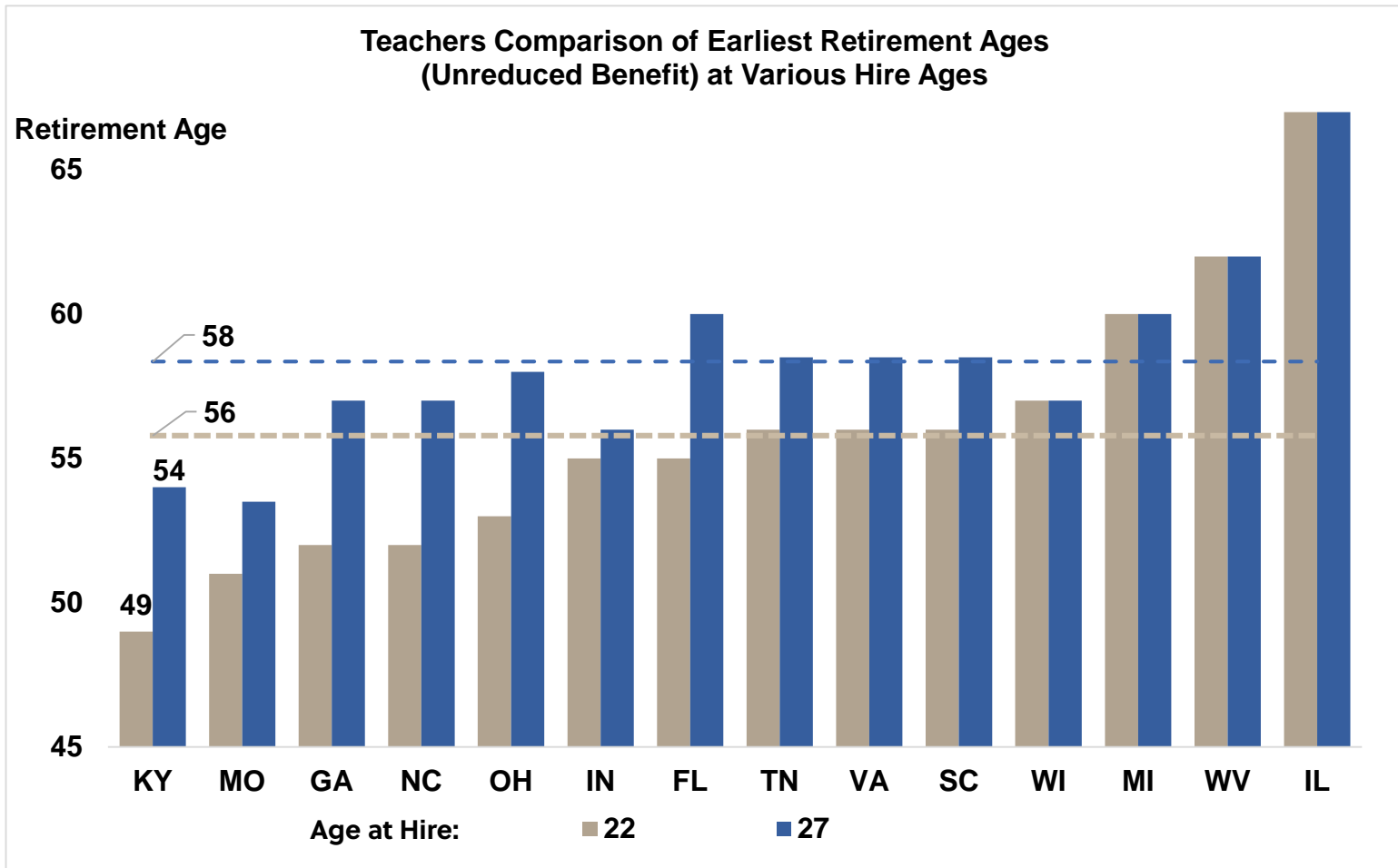
Investment Analysis

Investment Analysis: KRS Overview

- PFM Asset Management has developed a detailed analysis of the investment allocation, performance, and risk profile of each of the Commonwealth's retirement systems (see Appendix to the full Report 2)

- KRS total performance falls in bottom quartile for all trailing periods provided and significantly lags the investment return assumption. Asset allocation, with shifting targets over recent years, has been the primary detractor of relative KRS performance

  - International equity allocation increased from 40% of public equity to 50% of public equity in 2011 and lagged the Russell 3000 Index by more than 1.1% basis points annually

  - Hedge fund allocation of roughly 10% was added in 2011 and lagged the Russell 3000 Index by nearly 800 basis points annually

  - Real return allocation has averaged 8-10% of the portfolio during the past 5 years and has lagged the Russell 3000 Index by more than 800 basis points annually

  - Private equity allocation has added value over public equity for most trailing periods, but the investment return has lagged KRS' benchmark (Russell 3000 Index + 3%) by 260 basis points annually for the past 10 years

- Performance at the asset class level has generally been in-line with the relevant index for longer periods (10+ years), with the exception of real estate, indicating that asset allocation rather than manager selection has been the primary detractor of performance

KRS Pension – Performance vs. Benchmarks

As of June 30, 2016	3 Years	5 Years	7 Years	10 Years	Jul-2003 To Jun-2016
KERS - PEN	4.99	5.11	8.44	4.89	6.23
KERS - PEN Benchmark	5.75	5.82	8.82	5.45	6.55
Over/Under Performance	*-0.76*	*-0.71*	*-0.38*	*-0.56*	*-0.32*
KERS H - PEN	5.35	5.32	8.60	5.00	6.31
KERS H - PEN Benchmark	5.34	5.57	8.64	5.33	6.46
Over/Under Performance	*0.01*	*-0.25*	*-0.04*	*-0.33*	*-0.15*
CERS - PEN	5.07	5.16	8.48	4.91	6.25
CERS - PEN Benchmark	5.32	5.56	8.63	5.32	6.45
Over/Under Performance	*-0.25*	*-0.40*	*-0.15*	*-0.41*	*-0.20*
CERS H - PEN	5.39	5.35	8.62	5.01	6.32
CERS H - PEN Benchmark	5.32	5.56	8.63	5.32	6.45
Over/Under Performance	*0.07*	*-0.21*	*-0.01*	*-0.31*	*-0.13*
SPRS - PEN	4.98	5.10	8.44	4.89	6.23
SPRS - PEN Benchmark	5.43	5.63	8.68	5.35	6.48
Over/Under Performance	*-0.45*	*-0.53*	*-0.24*	*-0.46*	*-0.25*

Source: RV Kuhns Quarterly Investment Performance Reports as of 6/30/16.

KRS Pension – Asset Allocation Comparison

Asset Allocation Analysis
All Public Plans > $1 Billion
As of June 30, 2016

	US Equity		Intl. Equity		US Fixed Income		Intl. Fixed Income	Alternative Inv.		Real Estate		Cash	
■ KERS - PEN	18.1	(84)	20.2	(42)	21.3	(55)	0.0	33.2	(10)	3.8	(89)	3.3	(24)
▲ KERS H - PEN	26.5	(52)	26.1	(15)	11.8	(94)	0.0	28.6	(16)	5.1	(75)	1.8	(43)
▼ CERS - PEN	28.0	(48)	26.1	(15)	11.9	(94)	0.0	27.8	(17)	5.0	(75)	1.3	(52)
● CERS H - PEN	27.6	(49)	26.1	(15)	11.9	(94)	0.0	27.8	(16)	4.8	(77)	1.7	(47)
◆ SPRS - PEN	23.8	(66)	22.8	(29)	17.7	(71)	0.0	28.8	(16)	5.3	(73)	1.7	(47)
Median	27.1		19.1		22.0		3.4	15.6		7.2		1.3	
Population	103		100		96		58	83		77		82	

KRS Pension – Trailing Investment Performance

Plan Sponsor Peer Group Analysis
All Public Plans > $1 Billion
As of June 30, 2016

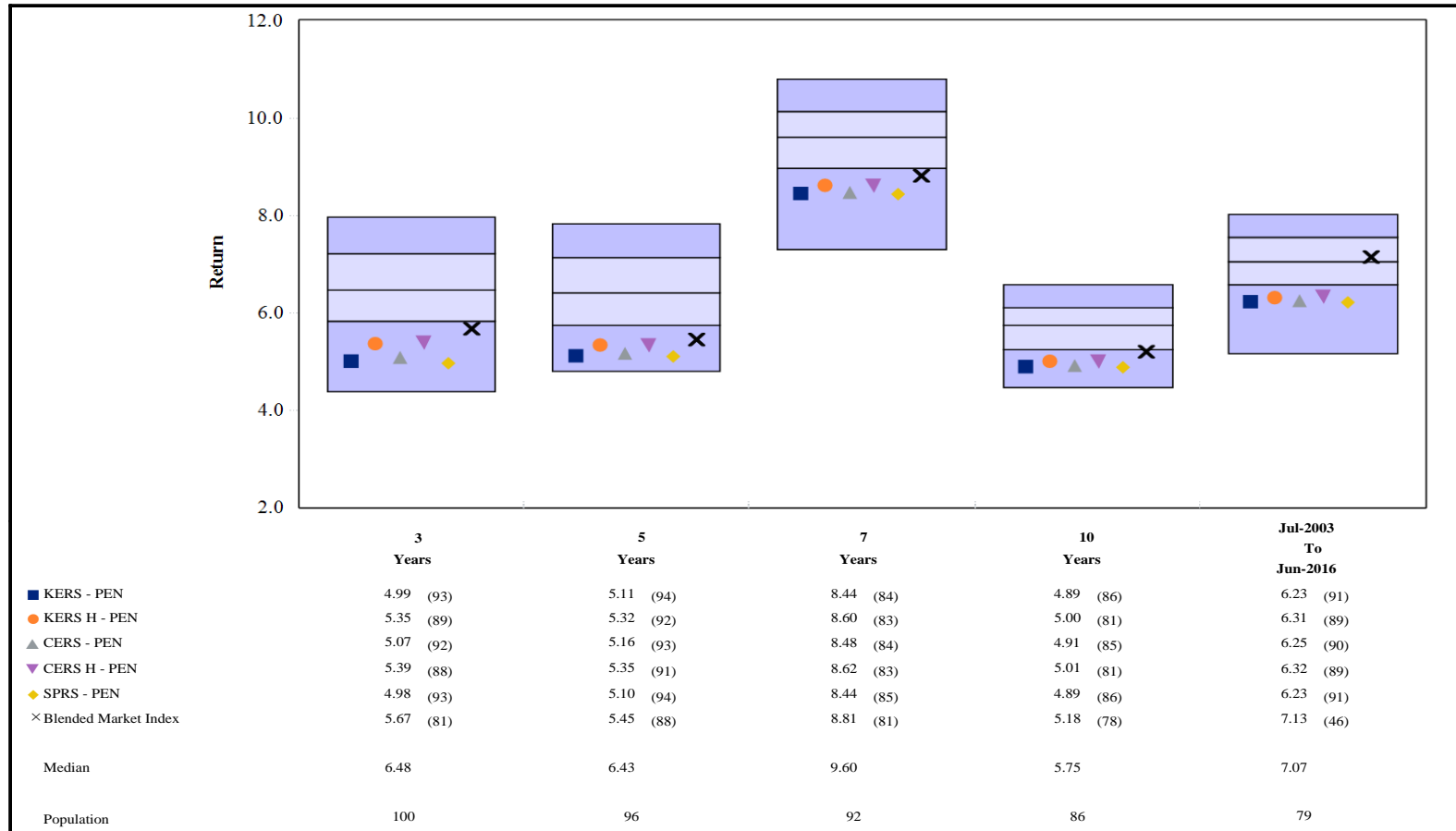|	3 Years		5 Years		7 Years		10 Years		Jul-2003 To Jun-2016	
■ KERS - PEN	4.99	(93)	5.11	(94)	8.44	(84)	4.89	(86)	6.23	(91)
● KERS H - PEN	5.35	(89)	5.32	(92)	8.60	(83)	5.00	(81)	6.31	(89)
▲ CERS - PEN	5.07	(92)	5.16	(93)	8.48	(84)	4.91	(85)	6.25	(90)
▼ CERS H - PEN	5.39	(88)	5.35	(91)	8.62	(83)	5.01	(81)	6.32	(89)
◆ SPRS - PEN	4.98	(93)	5.10	(94)	8.44	(85)	4.89	(86)	6.23	(91)
✕ Blended Market Index	5.67	(81)	5.45	(88)	8.81	(81)	5.18	(78)	7.13	(46)
Median	6.48		6.43		9.60		5.75		7.07	
Population	100		96		92		86		79	

Source: RV Kuhns Quarterly Investment Performance Reports as of 6/30/16 and Investment Metrics peer group data. Parentheses contain percentile rankings.

TRS Pension – Investment Performance Attribution
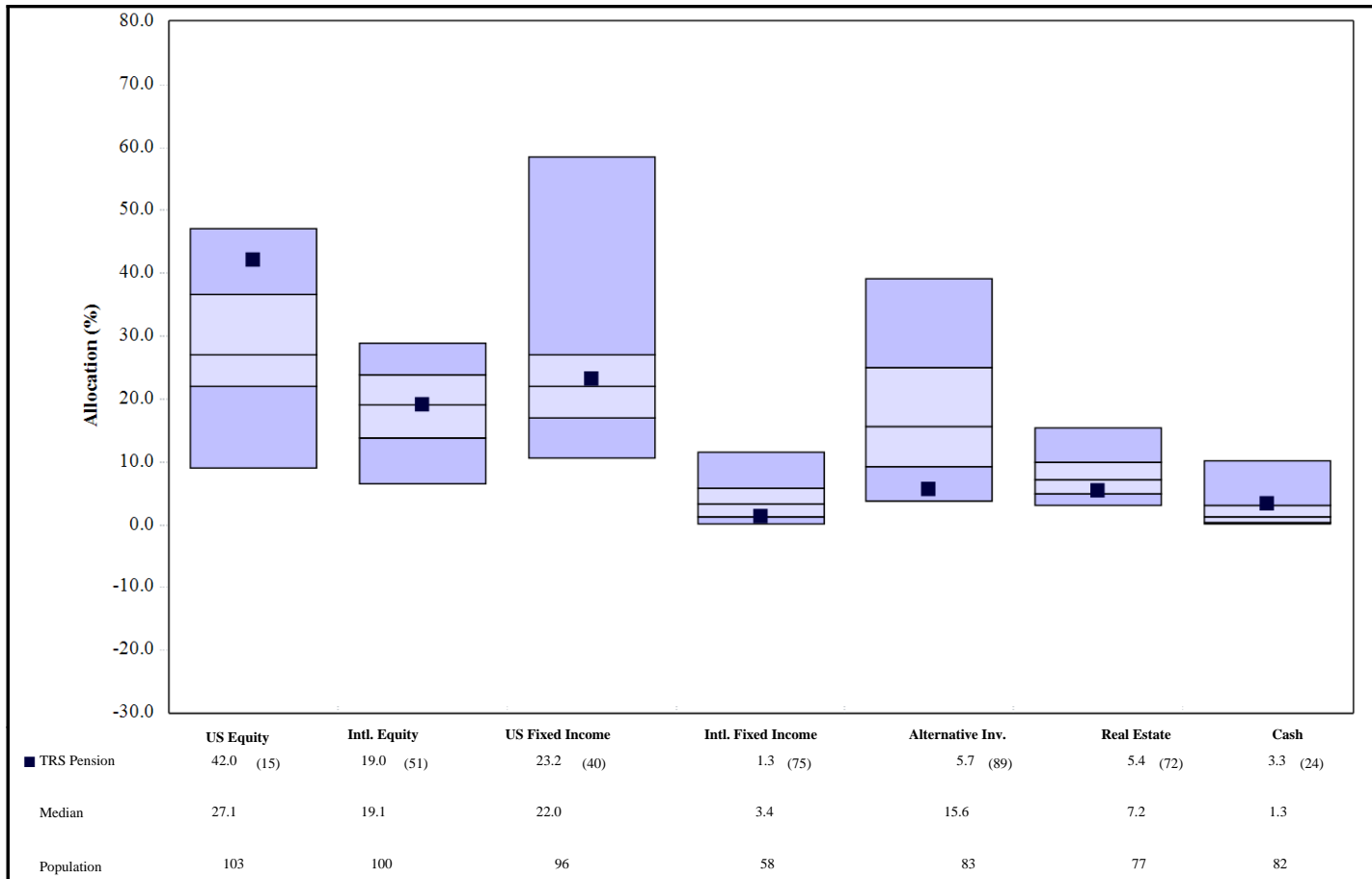
- Compared to a peer universe of public plans > $1 billion, TRS Pension performance ranked in the 76th percentile since July 2003 (6.58% return), the beginning date of the monthly returns data provided by TRS, however, improved to the 19th percentile over ten years (6.29% return)

- From FY 2009-2016, the Pension Plan's performance ranked above the 50th percentile in 6 out of the 8 fiscal year periods, after ranking close to the 90th percentile each year from FY 2004-2008

- International equity was absent from the portfolio until July 2005 and has gradually increased to 19%

  - The low allocation to international equity relative to domestic hurt performance from 2003-2007, and has contributed to the outperformance from 2008-2015

- The Plan has become more aggressive with increasing levels of risk over time, with fixed income representing 43% of the portfolio in March 2003 and gradually decreasing to 25% as of June 2016

- The TRS private equity allocation has helped overall performance with a return of 9.64% since it was included in the portfolio in July 2008, compared to a return of 8.68% for the Russell 3000
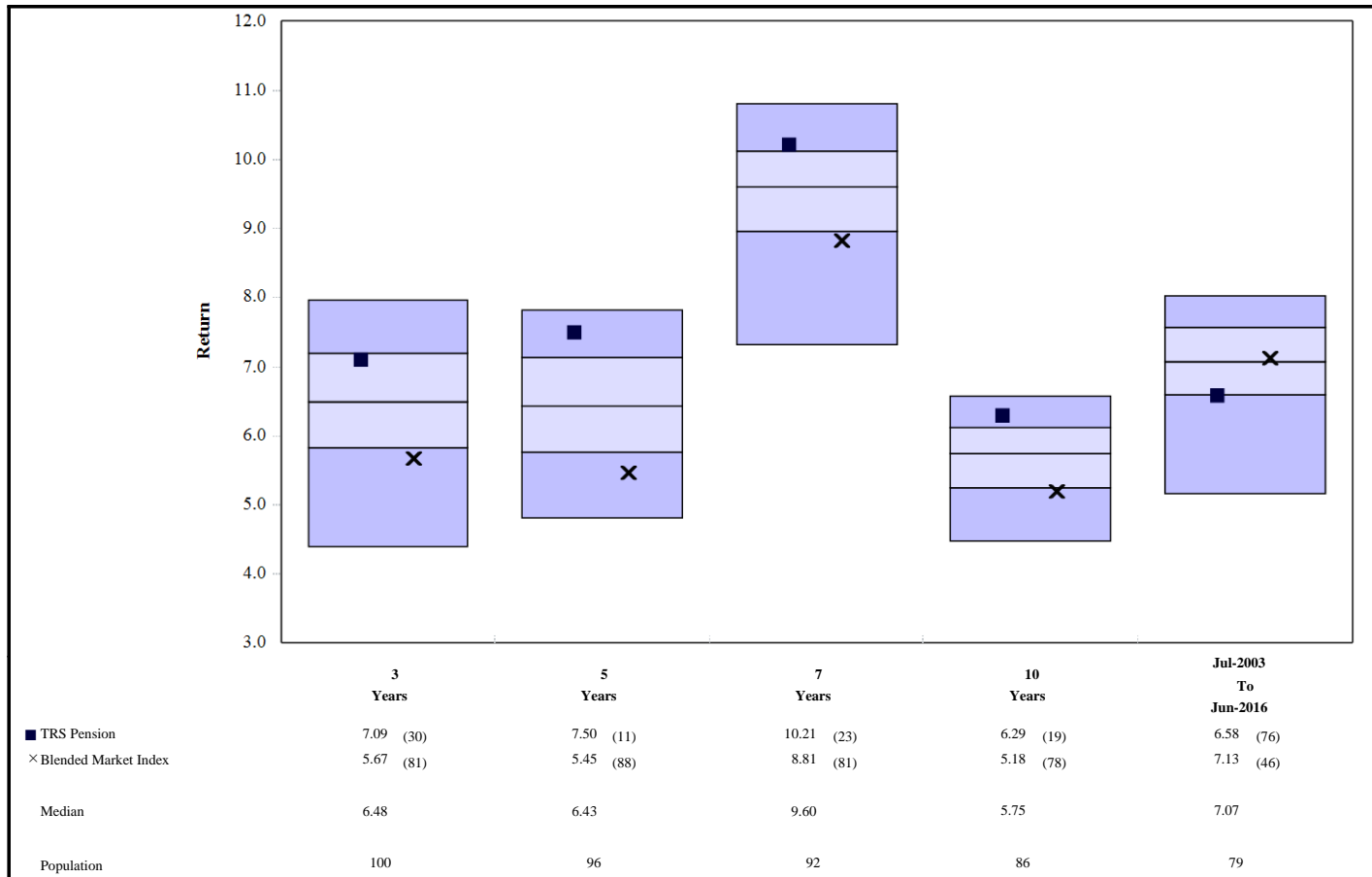
TRS Pension – Asset Allocation Comparison

Asset Allocation Analysis

All Public Plans > $1 Billion

As of June 30, 2016

	US Equity	Intl. Equity	US Fixed Income	Intl. Fixed Income	Alternative Inv.	Real Estate	Cash
■ TRS Pension	42.0 (15)	19.0 (51)	23.2 (40)	1.3 (75)	5.7 (89)	5.4 (72)	3.3 (24)
Median	27.1	19.1	22.0	3.4	15.6	7.2	1.3
Population	103	100	96	58	83	77	82

Source: Segal RogersCasey Quarterly Performance Reports as of 6/30/16 and Investment Metrics peer group data. Parentheses contain percentile rankings.

TRS Pension – Trailing Investment Performance

Plan Sponsor Peer Group Analysis
All Public Plans > $1 Billion
As of June 30, 2016

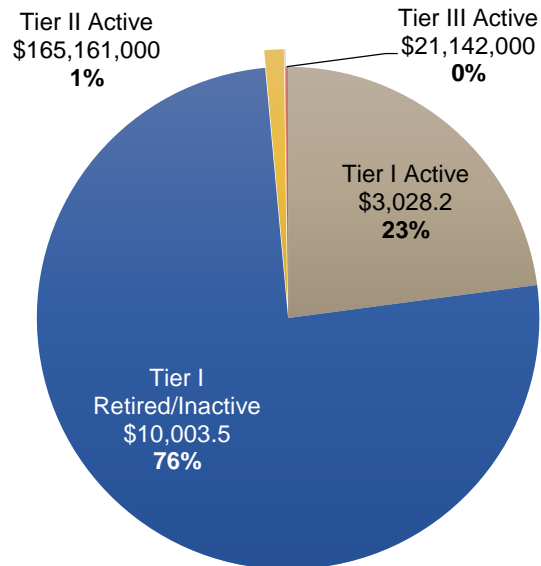|	3 Years	5 Years	7 Years	10 Years	Jul-2003 To Jun-2016
■ TRS Pension	7.09 (30)	7.50 (11)	10.21 (23)	6.29 (19)	6.58 (76)
✕ Blended Market Index	5.67 (81)	5.45 (88)	8.81 (81)	5.18 (78)	7.13 (46)
Median	6.48	6.43	9.60	5.75	7.07
Population	100	96	92	86	79

Source: Segal RogersCasey Quarterly Performance Reports as of 6/30/16 and Investment Metrics peer group data. Parentheses contain percentile rankings.
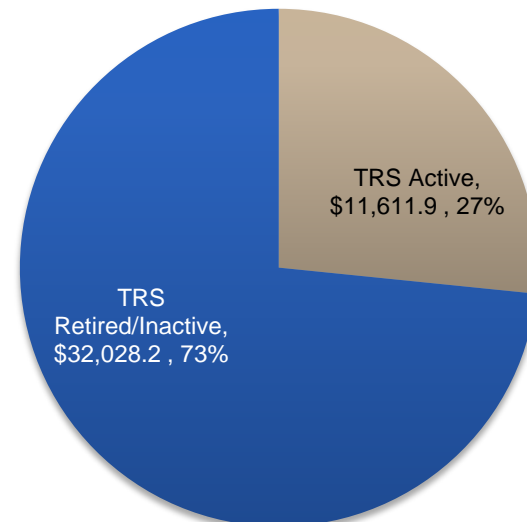
The Challenge Ahead

- Compounding the severe challenge ahead, the majority of accrued liabilities of the largest systems are associated with members who are already retired/ inactive

- As past reforms have shown, this complicates efforts to align costs and risk management with the ability to pay

KERS Non-Hazardous Accrued Liability by Tier

Tier II Active
$165,161,000
1%

Tier III Active
$21,142,000
0%

Tier I Active
$3,028.2
23%

Tier I
Retired/Inactive
$10,003.5
76%

TRS Accrued Liability by Status

TRS Active,
$11,611.9 , 27%

TRS
Retired/Inactive,
$32,028.2 , 73%

Report 3: Next Steps

- In Report #3, we will present ideas and alternatives for improving the long-term security, reliability, and affordability of Kentucky's retiree benefit programs

- Building on our analysis of factors that have led to the current conditions, including our previous Report #1 on transparency and governance, areas to be addressed prospectively are expected to include:
    - Actuarial method and assumptions
    - Investment practices and approach
    - Benefit levels and risk exposure
    - Funding policy

- Through past legislative reforms, recent Board actions, and significant additional funding in FY17-18, Kentucky has already taken positive steps in many of these critical areas

- Nonetheless, the continued scale of the Commonwealth's remaining challenge requires further strong, corrective action:
    - *A status quo approach is not sustainable*

Thank You

pfm