Commonwealth of Kentucky

Pension Performance and Best Practices Analysis

Interim Report #2:

Historical and Current Assessment

May 22, 2017

In conjunction with:

PRM Consulting Group
Stites & Harbison PLLC

Appendices

I. Executive Summary

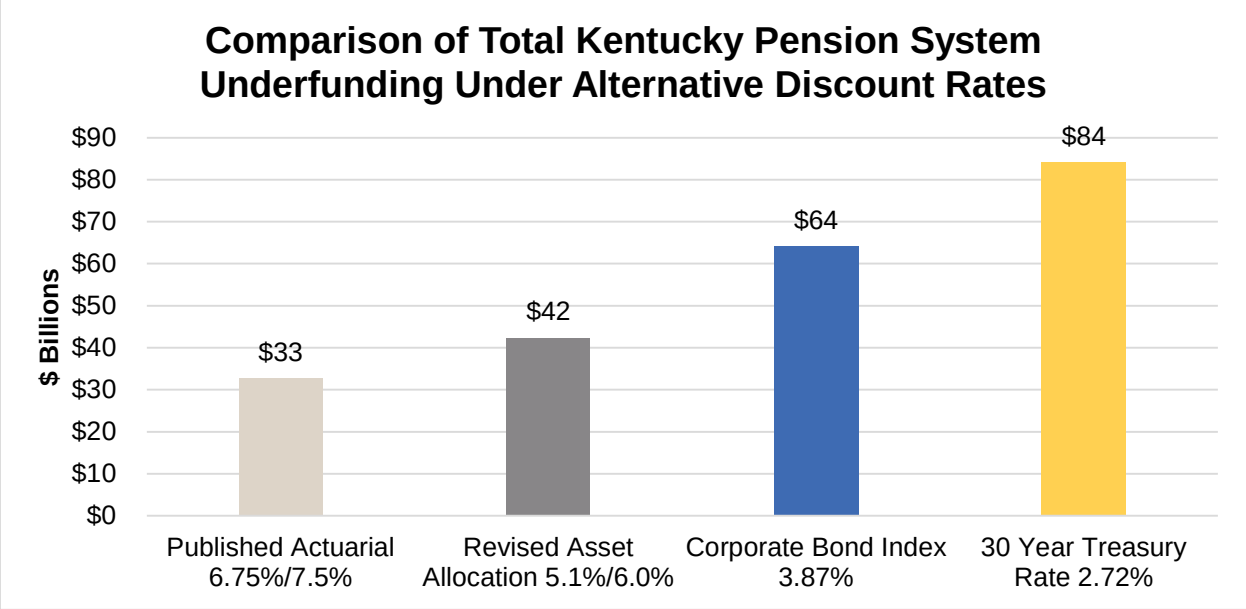
The Commonwealth of Kentucky sponsors three major retirement systems, collectively providing pensions and retiree healthcare benefits to tens of thousands of retired state, local government, school district, and nonprofit employees across the state. Within these three major systems, there are eight pension plans in all, each with different operating practices and benefit plan designs, covering specific employee groups.

For the pensioners and current workers within these covered groups, the reliability and security of these retirement programs are paramount. At the same time, these systems represent a significant investment for Kentucky's taxpayers, and their affordability and financial sustainability bear strongly on the capacity of the Commonwealth and its local governments to address other critical public needs.

Large Unfunded Liabilities

In the aggregate, the Commonwealth of Kentucky faces a funding shortfall across its pension systems of $33 billion even assuming the funds achieve targeted investment return rates of 6.75-7.5% ("published actuarial rate").

Figure 1



Source: PRM Consulting Group based on analysis of the actuarial reports

Based on alternate return assumptions for a 10-year investment horizon and increased liquidity requirements consistent with an updated KRS policy, 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, and with the equivalent average rate for U.S. Treasuries, it would total $82 billion – more than 7 times Kentucky's annual General Fund spending.[1]

In addition, according to the most recent actuarial valuations, Kentucky's retiree health benefits are underfunded by approximately $6 billion, over and above the pension shortfall.

Weakest Pension Funding of Any State

The Commonwealth's share of the retirement system aggregate pension underfunding has been calculated by the credit rating agency, Standard & Poor's ("S&P"), as the worst among the 50 states – with just 37.4% of total current obligations now funded, compared to a national median of 74.6% as of FY2015, the most recent period reported by S&P on this basis.[2]

- While the funding levels vary among the eight different plans supported by the Commonwealth, all are underfunded, and only the comparatively small Legislative and Judicial plans are funded at or above national averages.
- The primary pension plan for civilian state employees, the Kentucky Employees Retirement System Non-Hazardous pension plan (KERS-NH) was only 16% funded as of the end of FY2016 – one of the most challenged pension programs in the nation. This funded ratio was based on the actuarial assumptions as of June 30, 2016 and would be lower using more conservative assumptions.

The Commonwealth's unfunded liability is also one of the largest in proportion to the revenues available to pay for the liabilities, draining resources from other critical needs. According to the credit rating agency Moody's Investors Service, Kentucky had the third-highest net pension liability among the states when measured as a percentage of governmental revenues using standardized actuarial assumptions. This ratio for Kentucky's liability at 185% of total annual revenues was more than twice the average state burden of 75% and more than three times the median of 60%.

Eroding Financial Condition

As recently as FY2002 the KERS-NH plan was over 100% funded, and the Kentucky Teachers' Retirement System (TRS) plan was nearly 90% funded. The funded status of KERS-NH dropped precipitously and constantly thereafter, despite benefit reform efforts including the implementation of new benefit tiers for new hires in 2008 and 2014. Overall, the KERS-NH financial position fell

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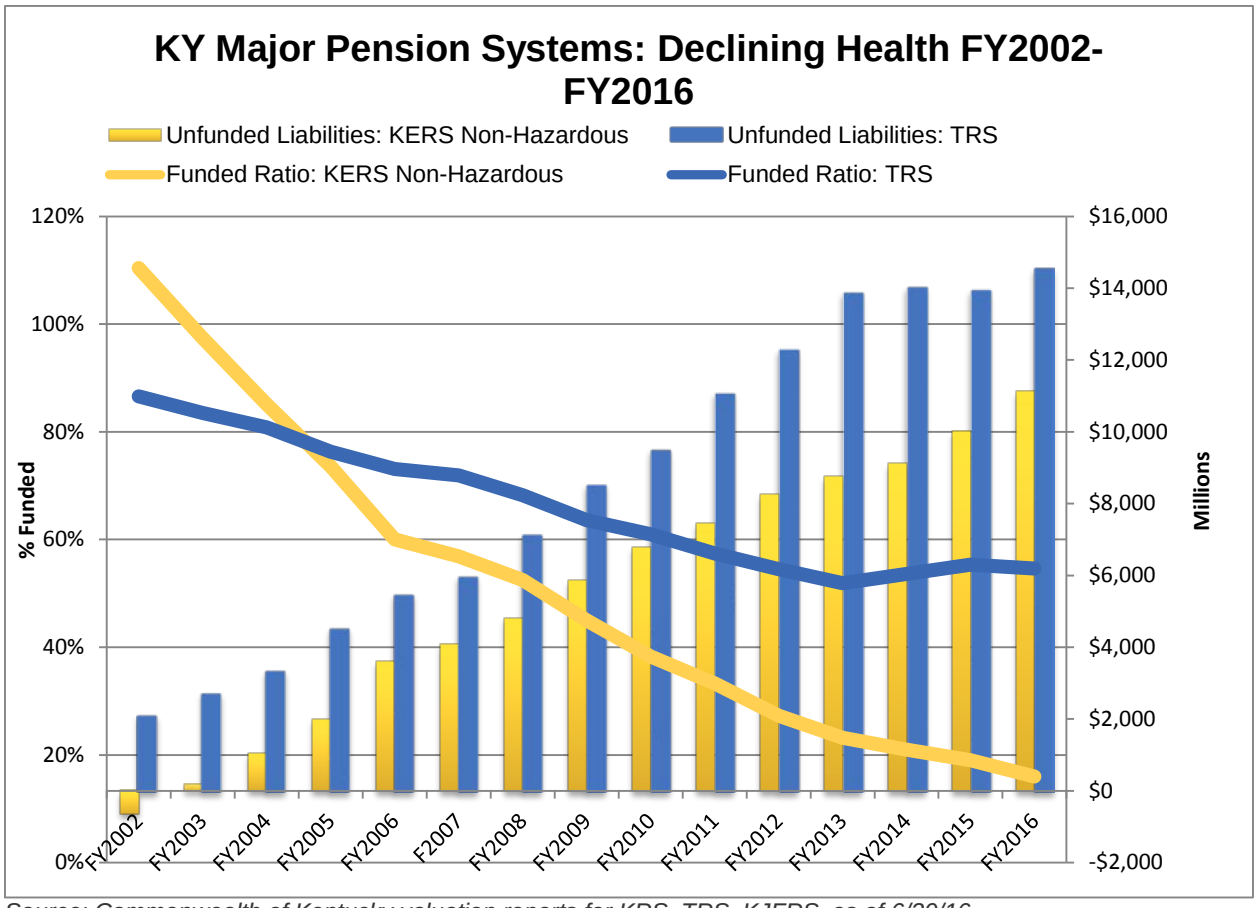
[1] *Corporate bond index rates from Citibank pension discount curve as of April 30, 2017; U.S. Treasury yield curve as of May 4, 2017.*

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

from a net asset surplus to an unfunded liability of over $11 billion. The declining health of the TRS pension fund has been more gradual and less severe, but nonetheless steady. Overall, the amount of TRS unfunded liabilities increased by nearly 600% between FY2002 and FY2016 as seen in Figure 2.

Figure 2



Source: Commonwealth of Kentucky valuation reports for KRS, TRS, KJFRS, as of 6/30/16

Multiple Factors Drove the Decline

Multiple factors contributed to the deteriorating funded status of Kentucky's pensions across the past decade, with the relative impact of these factors varying among the Commonwealth's different plans.

In the aggregate across all plans, the largest single factor underlying the decline was an actuarial funding approach that effectively "back-loaded" payments such that – even if the Commonwealth and other member employers had met all of the calculated actuarial funding requirements each and every year – these payments would still have been less than the annual interest on the Unfunded

Actuarial Liability ("UAL"), causing the UAL to grow. This "actuarial back-loading" is further detailed in Section V of the full report that follows. In addition, each of the plans modified various actuarial assumptions over this period – for example, adopting somewhat more conservative investment return assumptions and reflecting improving longevity by adjusting mortality rates. Together, the actuarial back-loading and assumption adjustments drove nearly half of the aggregate growth in underfunding (47%), and led to a majority of the shortfalls in the TRS and CERS-NH plans.

The past decade also saw many years of weak investment returns. Performance below actuarial assumptions led to about one-third of the aggregate funding decline. Although much of this experience was driven by the failure of the overall market to meet actuarial assumptions (which were even higher than current rate assumptions for much of this ten-year period), plan-specific investment performance below market-wide results was also a factor for most of the plans.

As seen in Table 1, for the TRS and KERS-NH plans in particular, Commonwealth payment levels below the Actuarially Required Contribution (ARC) were also significant factors, leading to 15% of the total funding decline across all plans. Other contributing factors were cost of living adjustment ("COLA") benefit enhancements granted in the earlier years of the decade evaluated, which created a new liability that has never been funded, and other elements of plan experience (such as mortality rates) that varied from actuarial assumptions then in effect.

Table 1

Causes	Factors Increasing the Unfunded Pension Liability 6/30/2005 to 6/30/2016 (Amounts in $Millions)									
	TRS	KERS-NH	KERS-H	CERS-NH	CERS-H	SPRS	KJRP	KLRP	TOTAL	% of 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%
Total	$9,996	$9,112	$343	$4,215	$1,222	$435	$133	$17	$25,473	100%

Cash Flow Trends and Solvency Risks

With this eroding funded status, three large Kentucky retirement systems, KERS-NH, CERS-NH, and TRS, have had negative cash flow for at least seven recent years, defined as inflows *(employer*

contributions, employee contributions, dividends and interest) being less than outflows (*benefit payments, administrative and operating expenses).*

KERS-NH has had severe negative cash flow of over $100 million every year since at least FY2002, and TRS has had negative cash flow nine of the last ten years, with the only exception being FY2011 when the proceeds of a $465.4 million pension obligation bond boosted system assets on a one-time basis. For CERS-NH, while the magnitude of the negative cash flow is smaller, it is nonetheless consistent – and has increased in recent years. In the near-term, such negative cash flow across these plans requires the liquidation of assets to meet current obligations, which can make it more difficult to achieve investment goals, or a more conservative investment strategy that allocates a relatively larger share of assets to liquidity and matches asset maturities to liabilities. Over the longer-term, such negative cash flows can ultimately threaten the solvency of the plans.

Table 2

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)

The at-risk condition of the KERS-NH plan in particular is highlighted by comparing the fund net position to the annual benefit payments. As of year-end FY2016, the KERS-NH fund had assets of just under $2.0 billion, which represented barely two years (783 days) of benefit payments on hand. Considering that KERS-NH lost $2.2 billion in plan assets in FY2008-FY2009, it is apparent that the system's ability to maintain assets for a pre-funded retirement system is acutely vulnerable to a sharp downturn that further threatens solvency.

Under current assumptions, including the statutory schedule for paying down the unfunded liabilities that backloads principal payments, the funded ratio for KERS-NH is estimated by the actuary to continue to decline, before gradually rising beginning in FY2023 – but only if all actuarial assumptions are met. In fact, even if the current assumptions of 6.75% annual investment returns and 4% annual payroll growth are achieved and the payment schedule is met in full, KERS-NH is still not estimated to reach 20% funded until FY2030, as can be seen in Table 3. A more conservative amortization schedule for paying down unfunded liabilities, a level dollar amortization – similar to a standard home mortgage schedule - would cost significantly more in the short term

but would make faster progress in reducing the unfunded liability, would eliminate reliance on changes in payroll as a variable, and would not backload principal payments as does the current funding schedule.

Table 3

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	$11,620.2	$11,257.9	12.9%	15.6%
2020	752.6	1,113.1	11,741.1	10,981.7	12.2%	17.9%
2021	793.3	1,117.3	11,788.5	10,642.9	12.0%	20.5%
2022	817.6	1,151.5	11,813.5	10,245.4	11.9%	23.6%
2023	851.9	1,099.4	11,804.5	9,874.7	12.1%	26.5%
2024	879.0	1,134.5	11,766.7	9,442.6	12.4%	29.7%
2025	912.1	1,071.0	11,692.2	9,046.9	13.0%	32.7%
2026	942.7	1,106.9	11,581.0	8,587.5	13.8%	36.1%
2027	976.7	1,040.2	11,427.5	8,166.3	14.9%	39.2%
2028	1,010.4	1,076.1	11,229.1	7,679.9	16.3%	42.7%
2029	1,044.0	1,005.8	10,983.0	7,233.8	18.0%	46.0%
2030	1,080.6	1,041.0	10,682.7	6,721.3	20.1%	49.7%
2031	1,114.8	968.8	10,327.0	6,249.2	22.5%	53.1%
2032	1,154.6	1,003.4	9,906.7	5,709.9	25.5%	57.0%
2033	$1,190.7	$929.8	$9,421.5	$5,211.2	28.9%	60.7%

Source: Cavanaugh MacDonald[3]

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

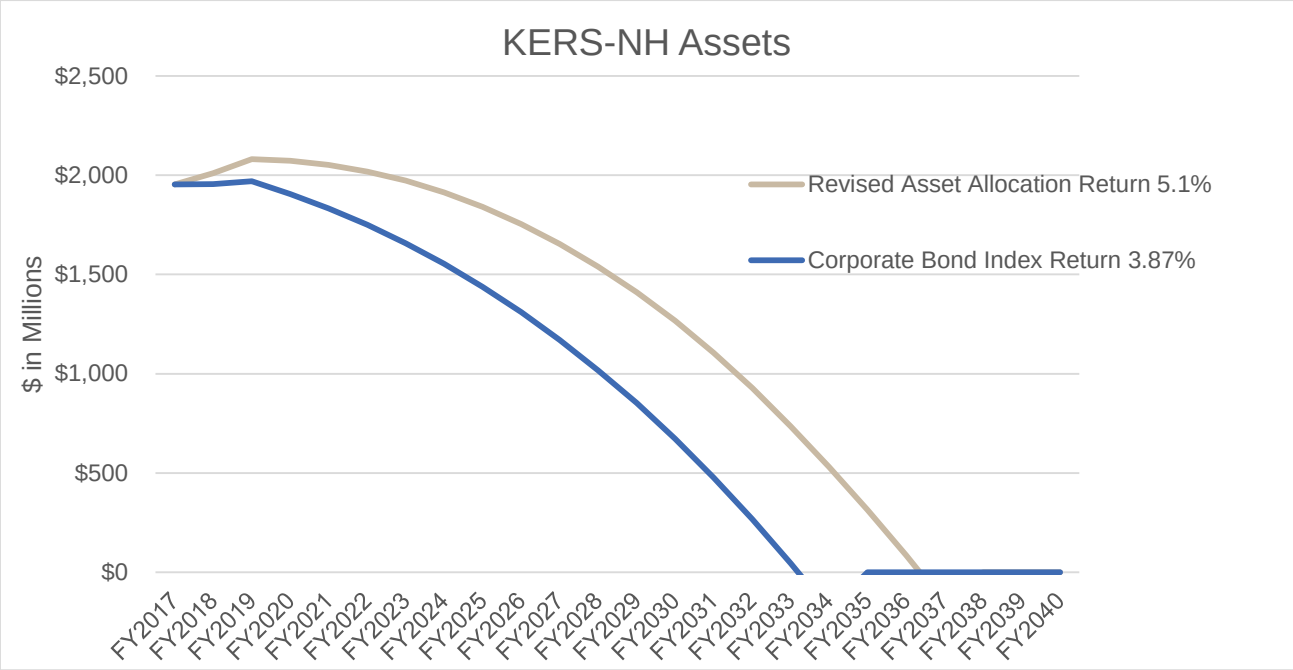
[3] *Certain actuarial data and calculations have been developed by Cavanaugh Macdonald Consulting LLC, plan actuaries for the KERS and TRS systems, under a subcontract with PFM in order to help ensure the accuracy of the estimates and projections herein.*

[4] *The level dollar amortization schedule is estimated to fluctuate somewhat due to the Commonwealth's biennial budget structure, and conversion of the amortization estimate to a payroll basis by the actuary's model.*

Further, continued solvency requires full funding. If the Commonwealth reverts to the pattern of underfunding the system that it followed from FY2004-FY2014, we project that the KERS-NH fund will be depleted by FY2022, just five years away.

Evaluating cash flows in a solvency analysis over a 30-year period under a range of alternative scenarios, we further project that KERS-NH will also become insolvent, even if more elevated recent patterns of budgetary contributions are maintained and a reduced payroll growth is assumed. Following ten years of a negative 1% compounded annual change in payroll, a 0% payroll growth assumption was applied, or effectively a level dollar amortization, rather than the 4% now assumed by the plan's actuaries. Following years of budgetary underfunding, the FY2016 through FY2018 budgets funded more than the Actuarially Determined Contribution (ADC). If the FY2016 or the average of the FY2016-2018 budgeted contributions are maintained going forward, KERS-NH is still projected to become insolvent, assuming either the Revised Asset Allocation or Corporate Bond Index return assumptions of 5.1% or 3.87%. If the enhanced overfunding of the FY2017-2018 budgets were maintained for future contributions, the plan is projected to remain solvent, even with 0% payroll growth and the Revised Asset Allocation or Corporate Bond Index investment returns.

Figure 3



Source: PRM Consulting Group

Note: 0% Payroll Growth. Ultimate contribution of FY2016 budget ($672 Million) annually

Similarly, while the TRS has a higher funded level and more assets on hand, we also project that the TRS could become insolvent in the decades ahead if the FY2018 employer contribution amount is not increased in future years and plan assets do not earn well above the private sector pension discount rate.

Competitive Benefits

The benefits offered to the Commonwealth's employees – including both pensions and retiree healthcare – are generous compared to the national and regional private sector. Section VI of this report on "Benefit Structure" encompasses detailed benchmarking of plan design and value. Key findings include:

- Most private employers nationally now support retirement primarily through 401(k)-style defined contribution ("DC") plans, and funding for retiree healthcare benefits has become increasingly rare across private industry. Relative to the 12 largest private Kentucky employers, the value of retirement benefits for the KRS plans also compares highly favorably.

- While public employers are still more likely to provide traditional defined benefit ("DB") pensions and retiree healthcare benefits, most states – including Kentucky – have modified benefits within the past decade to address sustainability concerns. In addition to the Commonwealth and its "hybrid' cash balance plan for recently hired KERS and CERS participants, 18 other states nationally now offer hybrid and/or DC plans for civilian workers.

- While Kentucky teachers do not participate in Social Security, the value of their DB pension nonetheless provides a comparatively generous overall benefit. Among the advantages of Kentucky's teacher plan, participants can retire at any age with 27 years of service or at age 55 with 10 years of service (5 years of service if hired before 7/1/2008). As a result, according to actuarial reports, the average age at retirement of a TRS member is 55 – below the age when teachers in many other states are even eligible for full benefits.

- Of 20 states benchmarked in detail for this report, Kentucky was also among just four that fully fund the employer contribution for teacher pensions at the state level. In contrast, nine states require local school districts to fully fund these contributions, and seven states share a portion of the contribution with local districts.

Next Steps

By evaluating the scale of Kentucky's retiree benefit funding pressures, analyzing the factors that have contributed to this challenge, and benchmarking approaches elsewhere, this Pension Report #2 is intended to provide important background and context for moving forward.

In the forthcoming Report #3, we will present ideas and alternatives for improving the long-term security, reliability, and affordability of these 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.

II. Overview of the Retirement Systems

Kentucky state law establishes three major retirement systems that collectively administer eight distinct retirement plans covering most state and local government and school district employees, as well as employees of some state universities and government-related non-profit entities. All three systems administer both pension and Other Post-Employment Benefit (OPEB) benefits for retirees and beneficiaries (primarily medical insurance coverage but also including dental, vision, and life insurance).

The systems and plans administered include:

- Kentucky Retirement Systems ("KRS")
  - Kentucky Employees Retirement System ("KERS")
    - Non-Hazardous employees plan ("KERS-NH")
    - Hazardous employees plan ("KERS-H")
  - State Police Retirement System ("SPRS")
  - County Employees Retirement System ("CERS")
    - Non-Hazardous employees plan ("CERS-NH")
    - Hazardous employees plan ("CERS-H")
- Teachers' Retirement System of Kentucky ("TRS")
- Kentucky Judicial Form Retirement System ("KJFRS")
  - Legislators' Retirement Plan ("KLRP")
  - Judicial Retirement Plan ("KJRP")

These eight plans involve a range of financial conditions and demographics, as illustrated in Table 4, of selected pension characteristics. In total, as of September 2015, the systems covered 204,580 active state, local, school, and nonprofit employees, 35,377 vested former employees not yet at retirement age, and 166,480 retirees already collecting benefits, for a total of 406,437 individuals.

Table 4

Commonwealth of Kentucky Retirement Plan Characteristics FY2016								
System	**KRS**					**TRS**	**KJFRS**	
Source of Employer Funding	**70% state non-hazardous, 98% state hazardous; 142 nonprofit and others**			**Local governments**		**95% State**	**State**	
Plan	**KERS-NH**	**KERS-H**	**SPRS**	**CERS-NH**	**CERS-H**		**KLRP***	**KJRP***
Active Members	37,779	3,959	908	80,664	9,084	71,848	101	237
Inactive Members	10,399	481	65	14,357	775	9,240	42	18
Retirees Receiving Benefits	44,004	3,966	1,515	56,339	8,563	51,563	200	330
Unfunded Actuarial Liability ($ in Millions)	$11,112.4	$377.2	$540.6	$4,541.1	$1,565.3	$14,531.3	$15.2	$115.0
Funded Ratio	16.0%	59.7%	30.3%	59.0%	57.7%	54.6%	85.1%	72.1%

Source: Commonwealth of Kentucky valuation reports for KRS, TRS, KJFRS, as of 6/30/2016

Note: Retirees Receiving Benefits - Number includes retired member and beneficiaries. Inactive members listed are inactive vested members; non-vested inactive members are not referenced.

**Information shown as of fiscal year ended 6/30/2015 as UAL is calculated biannually.*

The balance of this Report #2 will address key aspects of Kentucky's retirement programs both in the aggregate and for each plan individually:

- Liability analysis under alternative actuarial assumptions
- Fiscal pressures from underfunding
- Cash flow concerns and solvency analysis
- Sources of the increases in unfunded liability
- Benefit structure
- Investment analysis

Within this overview, the following highlights are noted:

Kentucky Retirement Systems

KERS-NH is the most severely underfunded of Kentucky's plans at just 16.0%. Its $11.1 billion shortfall represents over one-third of the Commonwealth's $32.8 billion combined pension Unfunded Actuarial Liability under current assumptions. KERS-NH is a mature plan that has more retirees receiving benefits (44,004) than active employees paying into the system (37,779), creating

a heightened reliance on returns from prefunded assets. As noted in the Executive Summary, without corrective action, these dynamics place KERS-NH at risk of depleting its remaining assets within a matter of just a few years.

KERS-H, covering State Corrections employees and other hazardous job classifications outside of the State Police, provides benefits to roughly one-tenth the number of participants as the KERS-NH plan (3,959 active and 3,966 receiving benefits). In addition, the Commonwealth has historically funded a higher percentage of the required employer contribution for KERS-H, such that the plan is 59.7% funded – still below national norms and well short of full funding, but not as severely challenged as the KERS-NH plan. As a result of its smaller size and better funded status, the total KERS-H liability at $377.2 million is far smaller than that of KERS-NH, even though plan participants can typically retire at younger ages under a benefit structure aligned with the hazards and physical requirements of their work.

The ***SPRS*** provides benefits for uniformed State Police officers, and is the smallest of the KRS state-level plans, with 908 active members and 1,515 retirees receiving benefits. As with KERS-H, SPRS participants can typically retire earlier than KERS-NH members. Despite fewer participants than the KERS-H plan, a weaker funded ratio of just 30.3% leads to a larger unfunded liability of $540.6 million.

The ***CERS-NH*** plan for local government employees is administered centrally at the state level as one group within the overall KRS retirement system. This is a common structure – 14 of 20 states benchmarked for our study similarly covered local government employees through the primary state retirement system. As the largest plan in the state by membership, CERS-NH covers 80,664 active workers and provides benefits to 56,339 retirees. With a 59.0% funded ratio, however, the plan's $4.5 billion liability is less than half the size of that for the smaller KERS-NH plan. In CERS, the benefit structure has historically been aligned with KERS, with generally similar benefits up through 2004 and matching benefits thereafter. Unlike the other KRS plans, however, CERS liabilities are liabilities of local governments and government-related entities, rather than the state. As a result, the historical funding has been different for CERS than the other systems, as will be addressed further in Section V of this Report on "Sources of the Increases in Unfunded Liability." Among other factors, participating local governments have typically paid the full ARC, while the Commonwealth has paid less than its full requirement in many years, contributing to CERS' higher overall funded ratio.

The ***CERS-H*** plan for local police, firefighters, and other hazardous employees is similarly funded by local governments, and has a 57.7% funded ratio, close to that of the CERS-NH plan. With a smaller number of participants (9,084 active and 8,563 retirees receiving benefits), the total unfunded liability is also smaller at under $1.6 billion, even with the earlier typical retirement ages associated with public safety jobs.

Teachers' Retirement System

The ***TRS*** has the largest unfunded liability among the Kentucky pension plans at $14.5 billion,[5] even with a funded ratio of 54.6% significantly higher than that of the KERS-NH plan. This is in part a function of the larger size of the TRS program, with 71,848 active members and 51,563 retirees receiving benefits. Although the TRS plan continues to have more active members than retirees, a significant number of active teachers, roughly 15,000 (25%) are currently eligible for retirement. Also contributing to TRS' larger liability, Kentucky teachers have higher average salaries than the average non-hazardous state employee – and also have a more generous pension benefit structure than provided under KERS-NH. It is important to note, however, that Kentucky teachers, unlike state and municipal employees, do not participate in Social Security.

Judicial Form Retirement System (JFRS)

Within the JFRS, the ***KJRP*** provides benefits for retired Justices of the Supreme Court and Judges of the Circuit, Family, District, and Appeals Courts. With just 237 active members and 330 retirees receiving benefits, this is a comparatively small plan. Historically, contributions to the JRP have been consistent with actuarial requirements, and the plan funded ratio is 72.1%. As a result, the total unfunded liability is also relatively small at $115.0 million.

Similarly, the ***KLRP*** serving retired members of the General Assembly has a comparatively small membership base (101 actives; 200 retirees receiving benefits), and a funded ratio of 85.1%. Overall, the LRP has the lowest unfunded liability of the eight State retirement plans at $15.2 million.

Other Post-Employment Benefits (OPEB)

Each of the eight Kentucky retirement plans also includes an Insurance Fund, which is the trust established to fund the retiree medical and other OPEB benefits. In the aggregate, OPEB unfunded liabilities of $5.9 billion represent approximately 15% of the Commonwealth's total retiree benefit funding shortfall, and will also be addressed throughout Report #2.

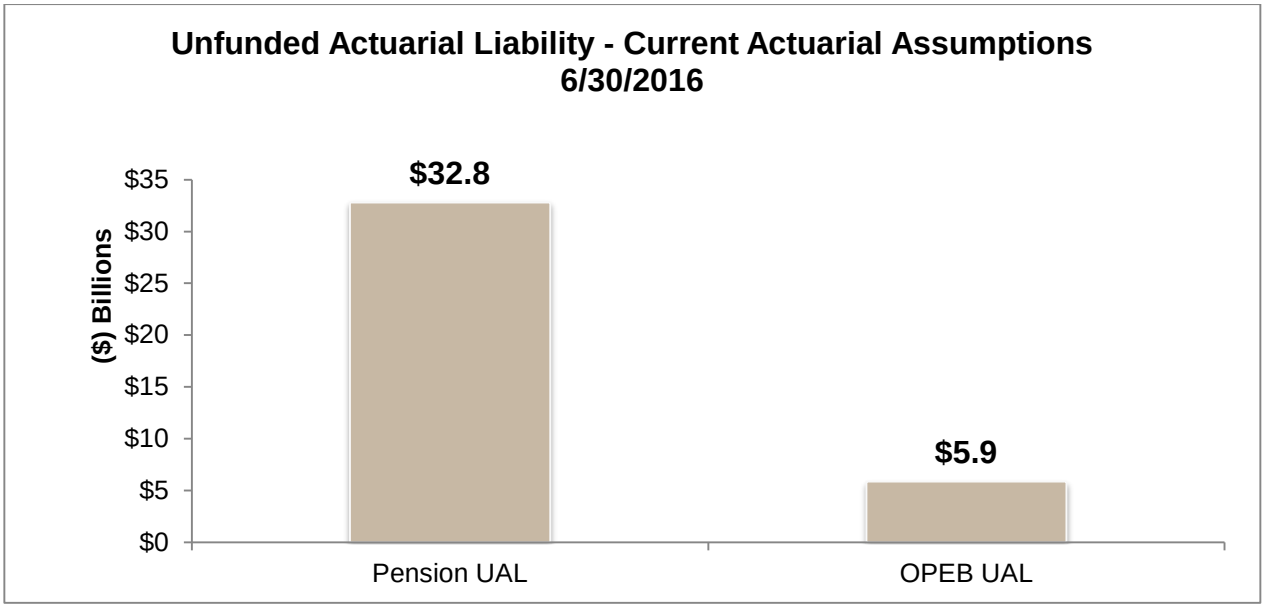
5 The TRS unfunded liability increases significantly to $30.9 billion on the GASB 67/68 basis, which requires the actuary to apply a significantly reduced discount rate to portions of the amortization period when recent patterns of underfunding required contributions require the actuary to project similar underfunding in future years, and as a result fund assets are projected to be depleted.

III. The Kentucky Retirement Funding Challenge

Magnitude of the Underfunded Liabilities

Under current actuarial assumptions, Kentucky's unfunded retiree benefit liabilities as of June 30, 2016 totaled $38.7 billion – $32.8 billion for pensions and $5.9 billion for OPEB, as can be seen in Figure 4.

Figure 4



Source: Commonwealth of Kentucky valuation reports for KRS, TRS, KJFRS, as of 6/30/2016

Such reported values of the total and unfunded liability of retiree plans like Kentucky's are dependent on the assumptions used by the actuary. Under alternative actuarial assumptions, the scale of the calculated liability and funded status will vary. As noted in the most recent Public Fund Survey[6] conducted by the National Association of State Retirement Administrators ("NASRA"):

> *Of all actuarial assumptions, a public pension plan's investment return assumption has the greatest effect on the projected long-term cost of the plan. This is because over time, a majority of revenues of a typical public pension fund come from investment earnings.*

6 National Association of State Retirement Administrators, "Public Fund Survey, Summary of Findings for FY2015," December 2016.

Even a small change in a plan's investment return assumption can impose a disproportionate impact on a plan's funding level and cost.

Accordingly, some analysts substitute alternate assumptions for key variables in order to standardize their evaluations and compare plans on an "apples-to-apples" basis. In addition, alternative actuarial scenarios can be used to evaluate "what if" scenarios and risks, such as the potential impact of lower investment returns than the actuaries assume.

As of FY2016, Kentucky investment return assumptions, which are also used as the discount rate in public pension plan accounting, range from 6.75% to 7.50%, were as follows:

Table 5

Pension Plan	FY2016 Discount Rate
Kentucky Teachers' Retirement System	7.50%
Kentucky Employee Retirement System - Hazardous	7.50%
County Employee Retirement System - Non-Hazardous	7.50%
County Employee Retirement System - Hazardous	7.50%
Kentucky Judicial Retirement System	7.00%
Kentucky Legislative Retirement System	7.00%
Kentucky Employee Retirement System - Non-Hazardous	6.75%
State Police Retirement System	6.75%

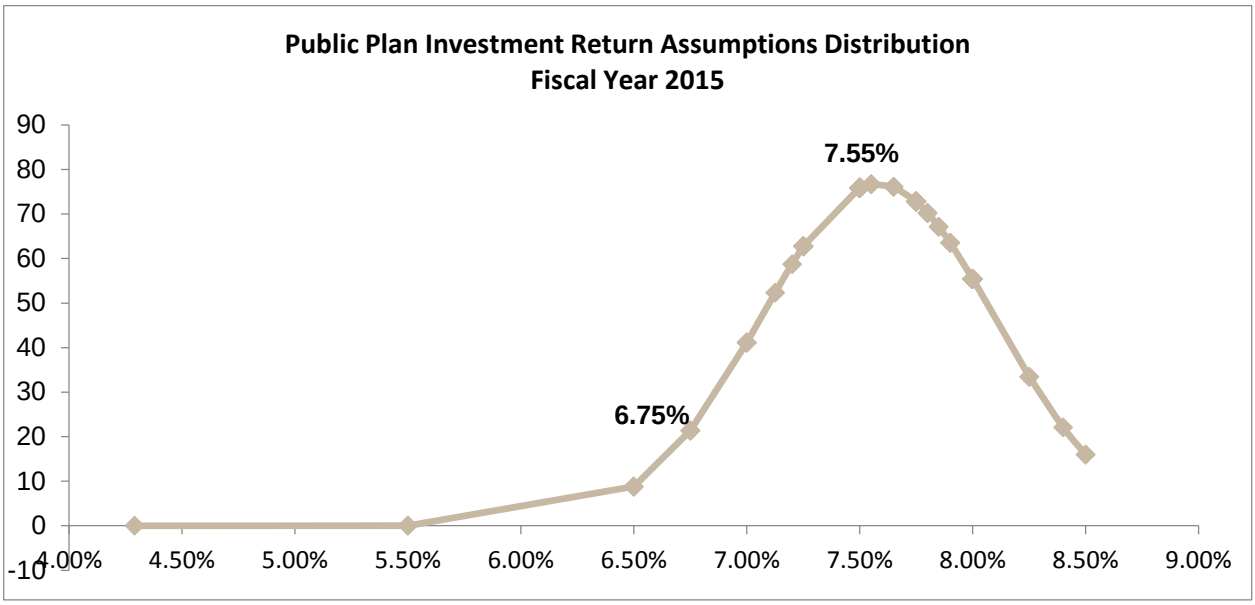
Source: KRS, TRS, KJFRS valuation reports

The 7.0-7.5% used by most Kentucky plans are consistent with common practice nationally, while the 6.75% rate adopted by the KRS Board in December 2015 for the KERS-NH and SPRS plans is at the lower end of the range among state and local pension plan investment return/discount rate assumptions. According to NASRA, the average state retirement system investment return assumption was 7.52% in February 2017, down from 7.66% the prior year as part of an ongoing trend toward de-risking plans through reduction of the return assumptions, as "among the 127 plans measured, nearly three-fourths have reduced their investment return assumption since fiscal year 2010."[7] Similarly, a slightly larger sample of state and large local plans from the Public Plans Data website maintained by the Center for Retirement Research at Boston College ("Public Plans Data" or "PPD") reported a similar average investment return assumption of 7.58%, both factoring in the

[7] *National Association of State Retirement Administrators (NASRA) Issue Brief: Public Pension Plan Investment Return Assumptions, February 2016 and February 2017*

KERS-NH rate.[8] The distribution of assumptions reported across Public Plans Data is illustrated in Figure 5 below.

Figure 5



Source: calculated from Public Plan Data for Fiscal Year 2015, maintained by the Center for Retirement Research at Boston College

Two of the six sample plans with lower investment return assumptions than KERS-NH and SPRS have special conditions:

- The Portland Police and Fire Disability Retirement Fund reported an assumed return of 4.29%. This fund is essentially funded on a pay-as-you-go rather than pre-funded basis, and is supported by a dedicated local real estate tax.[9]
- The Wisconsin Retirement System applied a 7.2% investment return assumption to the accrued liability associated with active and inactive employees, and a 5.0% investment return assumption to the accrued liability associated with post-retirement members. The blended rate at 12/31/2015 was therefore 5.50%.[10]

8 National Association of State Retirement Administrators (NASRA) Issue Brief: Public Pension Plan Investment Return Assumptions, February 2016, and Public Plans Database.

9 City of Portland FY16 CAFR.

10 Wisconsin Retirement System Funding Policy.

The rate adopted for KERS-NH and SPRS, while lower than average, also reflects special conditions. The low funded ratio of the plans and ongoing cash flow issues, addressed further in a later section, may limit the ability of the plans to pursue a long-term return-seeking asset allocation, and instead require them to hold relatively more assets in short-term fixed income investments and cash in order to pay benefits and avoid losses, when compared to other plans.

In addition, in the current economic environment, the trend among public plans in recent years has been to adopt lower investment return rate assumptions. Since the start of the decade, the median assumption has dropped from 8.0% to 7.5%, and the number of plans with assumptions below 7.0% has increased.[11]

Under federal Employee Retirement Income Security Act ("ERISA") standards for private plans, nongovernmental plan sponsors typically discount liabilities for reporting and funding based on high-quality corporate bond rates. "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."[12]

In contrast, the standard discount rate approach for public pension plans as defined by the Governmental Accounting Standards Board ("GASB"), which has been designated by the American Institute of Certified Public Accountants as the administrator of generally accepted accounting principles for U.S. state and local governmental entities, continues to be to use the expected long-term earnings rate on plan assets. The rationale for using the long-term earnings rate for public plans includes factors such as:

- The relatively long working tenure with the same employer, and relatively early normal retirement age of typical participants in public plans, which produces more years of benefit payouts post-retirement.
- The relatively low risk of a state and local government entity going bankrupt, going out of business or being acquired, which, it is argued, makes the ERISA standard for calculating "settlement costs" of the liability and/or market-based "spot rates" of interest rates at a point in time, less appropriate.
- The increased funding volatility associated with using market-based bond rates in the ERISA standard, which would cause contribution instability in government budgeting.

11 National Association of State Retirement Administrators, "Public Fund Survey, Summary of Findings for FY2015," December 2016.

12 United States Government Accountability Office, Pension Plan Valuation: Views on Using Multiple Measures to Offer a More Complete Financial Picture, September 2014.

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 that are 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 in cases where the actual contributions have consistently been materially below the required contribution, and therefore assets are projected to be depleted, as was the case with the FY2015 and FY2016 TRS and KJFRS reports. The most recent GASB blended discount rates applied were 4.20% for TRS for FY2016, while the rates for KJRP and KLRP in FY2015 were 6.41% and 6.85%, respectively.

While GASB and various industry and professional associations continue to support the use of the earnings-based approach, again, a key question remains as to what an appropriate projection should be in the current economic environment – and whether 6.75% to 7.5% remains reasonable over the long-term. This must be addressed by both investment professionals and policymakers.

Further, the use of alternative assumptions in valuing liabilities has also been recognized as a potentially valuable tool in understanding plan risk and protecting against declines in funded ratios as have occurred nationally since FY2000. Following expert study and testimony, the United States GAO observed that "there may be value in having multiple liability measures to arrive at funding, benefit, and investment policies that will better balance risks and rewards to plan participants and all other stakeholders." An independent panel commissioned by the Society of Actuaries recommended that plan trustees "obtain a direct estimate of the degree to which the plan anticipates it will achieve its funding goals by realizing a premium earned on risky assets, by comparing liabilities under the standard assumptions to "the plan liability and normal cost calculated using a risk-free rate (e.g., the U.S. Treasury yield curve), based on the plan's actuarial funding method and demographic assumptions."[13]

In order to assess the investment risk associated with the retirement systems and more fully understand how the discount rate assumption affects the actuarial calculations, beyond the 1% deviation in rate sensitivity analysis that is also required by GASB 67 and 68, the following analysis applies several alternative bond-based or "risk-free" discount rates and re-estimated the total and unfunded liability:

- A Revised Asset Allocation rate. A rate of 5.1% was applied to KERS-NH and SPRS, and a rate of 6.0% was applied to all other plans. Our understanding is that KRS is updating its asset allocation approach to reflect the varying degrees of stress and diminished assets of its plans. Based on our understanding of this approach, we developed alternate return

13 Society of Actuaries, Report of the Blue Ribbon Panel on Public Pension Plan Funding, February 2014.

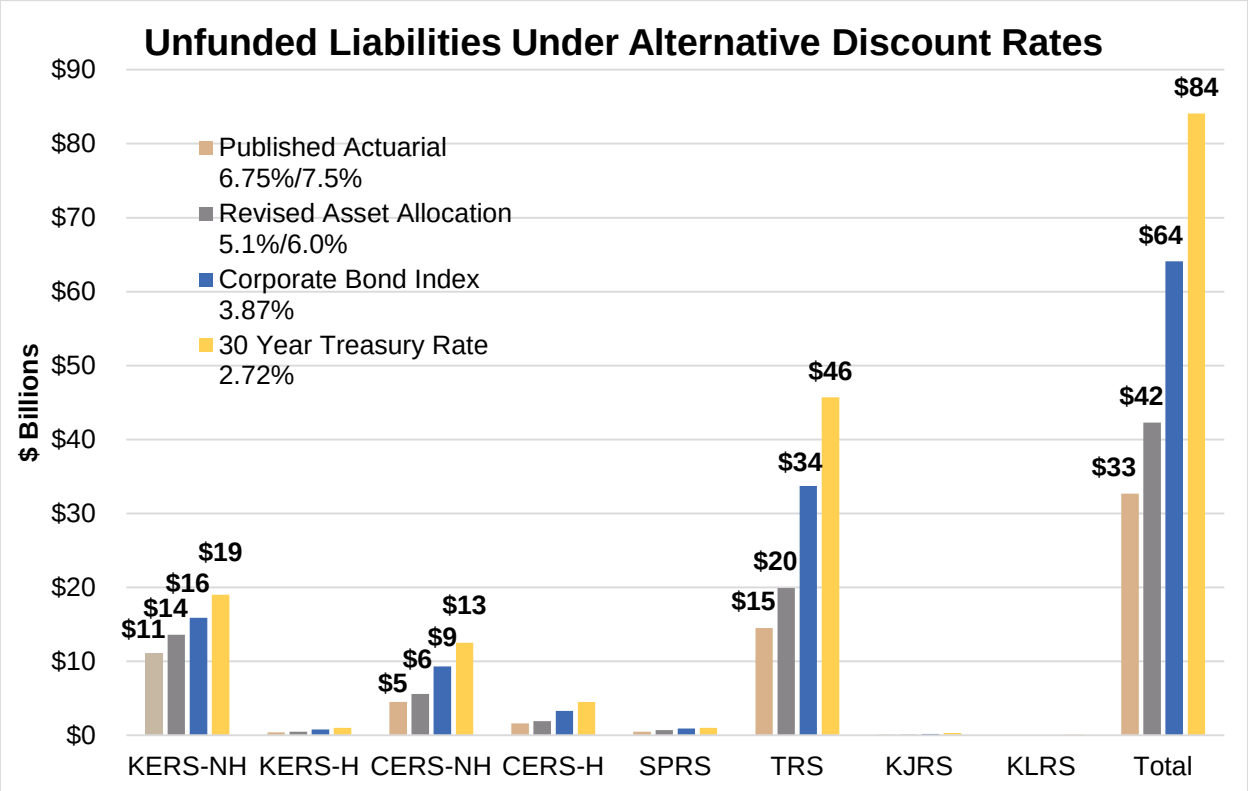
assumptions for a 10-year investment horizon and two levels of increased liquidity positions consistent with an updated KRS policy, with an allocation of up to 25% short-term bonds and 25% cash for the highly stressed plans. These assumptions were based on PFM Asset Management's expected 10-year return 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.

Although the policy of KRS does not directly apply to the TRS or KJFRS plans, the persistent underfunding of these plans, corresponding application of the depletion date and blended rate under GASB 67, and the recurring and large negative cash flows projected by the actuary of the TRS plan all support the application of a similar Revised Asset Allocation rate of 6.0% for the TRS and KJFRS plans.

- Corporate Bond Index rate. The Citibank corporate bond index rate was used for valuation of private sector pension plans and made available through the Society of Actuaries for these purposes. The appropriate rate for the time period when projected benefits would be paid was applied, and a weighted average rate for the future liabilities was calculated. The weighted average rate across the yield curve as of April 30, 2017 was 3.87%.
- U.S. Treasury rate. The weighted average rate across the yield curve as of May 4, 2017 was 2.72%.

As illustrated in Figure 6, the aggregate unfunded liability for pensions alone increases from a reported level of $33 billion to $42 billion with the Revised Asset Allocations, $64 billion using typical private sector standards, and up to $84 billion using the weighted average Treasury or "risk-free" rate.

Figure 6



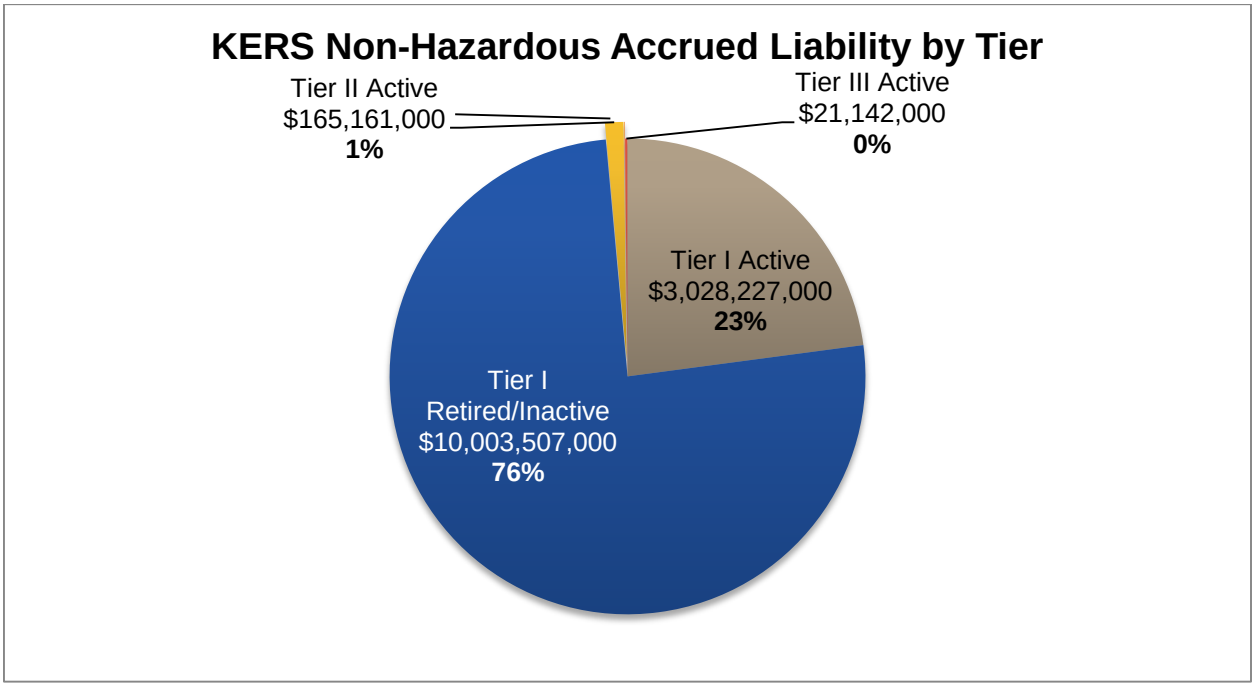
Source: PRM Consulting Group

Liability Composition

In evaluating the scale of Kentucky's liability, a further perspective is to disaggregate the total liabilities to evaluate how much of the challenge is associated with different cohorts of plan participants. Based on the category of plan participant – for example, still active versus already retired, and/or Tier I (pre-2008 hire date) versus Tier 2 (post-2008 hires under a modified benefit structure) – the options and opportunities for future reform may vary.

For example, as shown in Figure 7, the accrued liabilities for the system with the lowest funded ratio, and the second-lowest ratio of active employees to retirees, KERS-NH, are heavily associated with members that have already retired. Over three-quarters of the accrued liability at 6/30/2016 was attributable to Tier I (pre-2008 hire date) members that had entered retired or inactive status. Less than 2% of the accrued liability was associated with post-2008 hires.

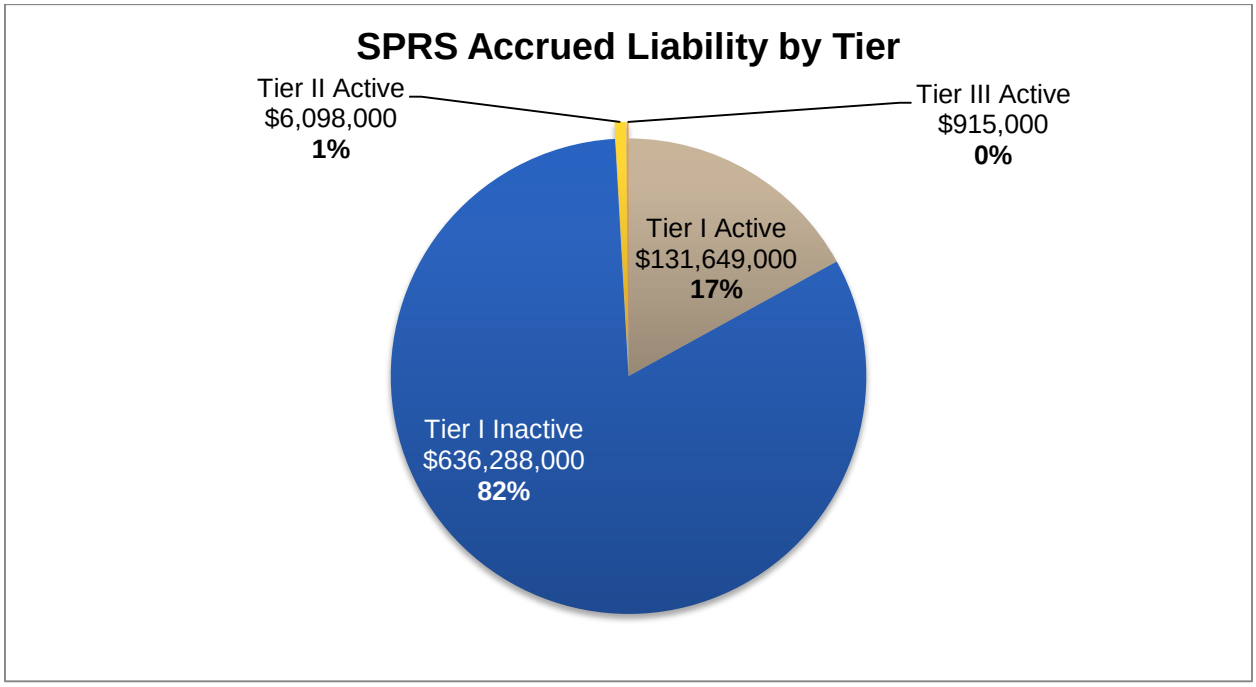
Figure 7



Source: Cavanaugh MacDonald, based on June 30, 2016 actuarial valuation and valuation assumptions including 6.75% earnings assumption and 4% payroll growth.

Similarly, the State Police Retirement System has the lowest ratio of active employees to retirees, due in part to its lower retirement age eligibility criteria relative to the other systems. The unfunded liability associated with retired and inactive Tier I members is therefore even higher than for KERS-NH, as seen in Figure 8 on the following page.

Figure 8



Source: Cavanaugh MacDonald, based on June 30, 2016 actuarial valuation and valuation assumptions including 6.75% earnings assumption and 4% payroll growth.

Comparative Funded Levels

The size of the unfunded liability for Kentucky's retirement systems is not only large in absolute terms, it is also large in comparison to other states. According to a recent Standard & Poor's credit rating agency analysis that evaluated each state's proportionate share of liability for public employee pensions as of FY2015, the most recent report available, Kentucky systems had the worst overall ranking – with combined funding set aside at just 37.4% of the levels required to pay for current long-term obligations shown in Table 6. This ranking by Standard & Poor's excluded liabilities for CERS and for the non-state employers in KERS. Ranked last out of 50, Kentucky's funded ratio was roughly half the median among state proportionate liabilities.

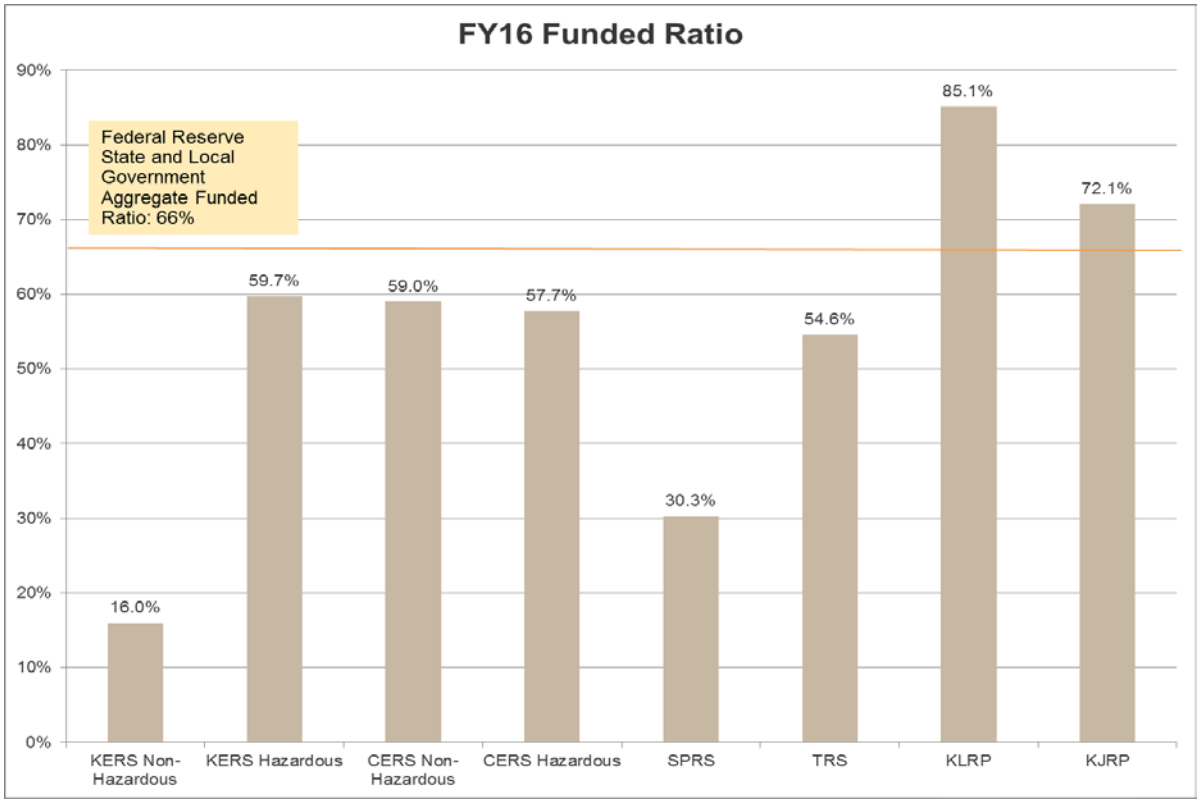
Table 6

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

Comparison of the funded ratio for each Kentucky pension plan individually to national averages indicates that all but the two smallest pension plans sponsored by the state are underfunded. In aggregate, across the country, state and local government defined benefit pension plans were underfunded by $1.9 trillion as of June 30, 2016 (according to the Federal Reserve Bank), with an aggregate funded ratio of 66.0% as seen in Figure 9 on the next page.

Figure 9



Source: Commonwealth of Kentucky valuation reports for KRS, TRS, KJFRS, as of 6/30/2016; Federal Reserve Board Financial Accounts of the United States

Although FY2016 data is not yet available for the Public Plans Data sample, the FY2015 funded ratio for the plans in the sample was 74.1%, according to the Center for Retirement Research, which is consistent with the Federal Reserve data. Only the two KJFRS plans exceeded the Federal Reserve average.

Measures of average OPEB funded ratios beyond state-level comparisons are less available, but a Center for Retirement Research survey published in March 2016 using FY2013 data found that the aggregate state and local government funded ratio was 7.0%. More recently, Standard & Poor's reported that the average and median funded ratio for state governments specifically in FY2015 was 0%, as most states had not pre-funded any of their liability. Compared to either OPEB metric, every Kentucky plan was relatively well-funded for this smaller component of its overall retiree benefits program.

Table 7

FY2016 Funded Ratios - OPEB	Insurance Fund
KERS Non-Hazardous	30.3%
KERS Hazardous	125.3%
CERS Non-Hazardous	69.6%
CERS Hazardous	72.9%
SPRS	67.2%
TRS	21.9%
KLRP	127.3%
KJRP	104.7%
National Average [1]	7.0%

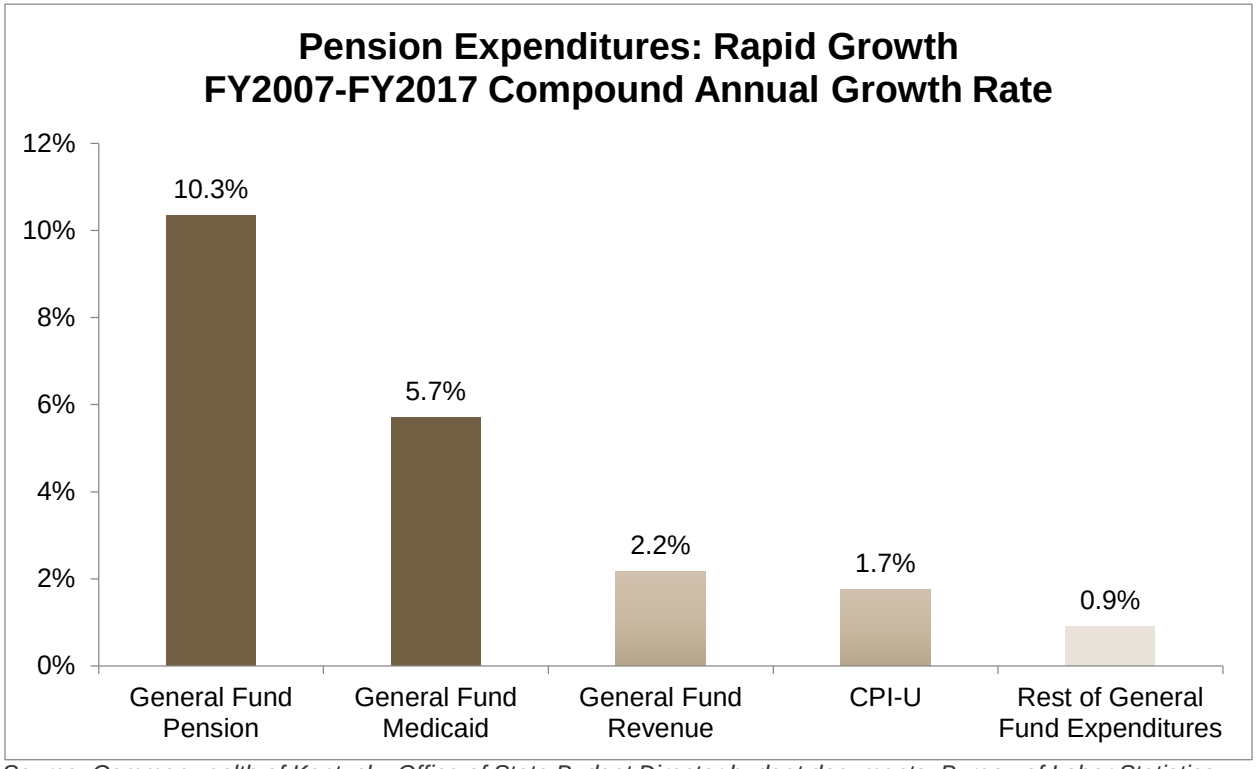
Source: Commonwealth of Kentucky valuation reports for KRS, TRS, KJFRS, as of 6/30/16; Federal Reserve Board Financial Accounts of the United States; Center for Retirement Research How Big a Burden Are State and Local OPEB Benefits?, March 2016

Fiscal Pressures from Underfunding

The size of Kentucky's unfunded pension liability in turn drives elevated levels of required contributions. As a result, and with the Administration and Legislature's commitment to more fully funding these requirements, the trend in the Commonwealth's budget allocation for pensions has been for expenditures to increase far faster than the rest of the budget – significantly crowding out other spending priorities, even as the unfunded liability has increased.

As shown in Figure 10, over the past decade, Commonwealth pension spending has increased nearly five times as fast as revenues – growing 56% in FY2017 alone. Along with fast growing Medicaid costs, this has severely constrained growth in the rest of the budget to below inflationary levels, even as the Commonwealth's population has increased.

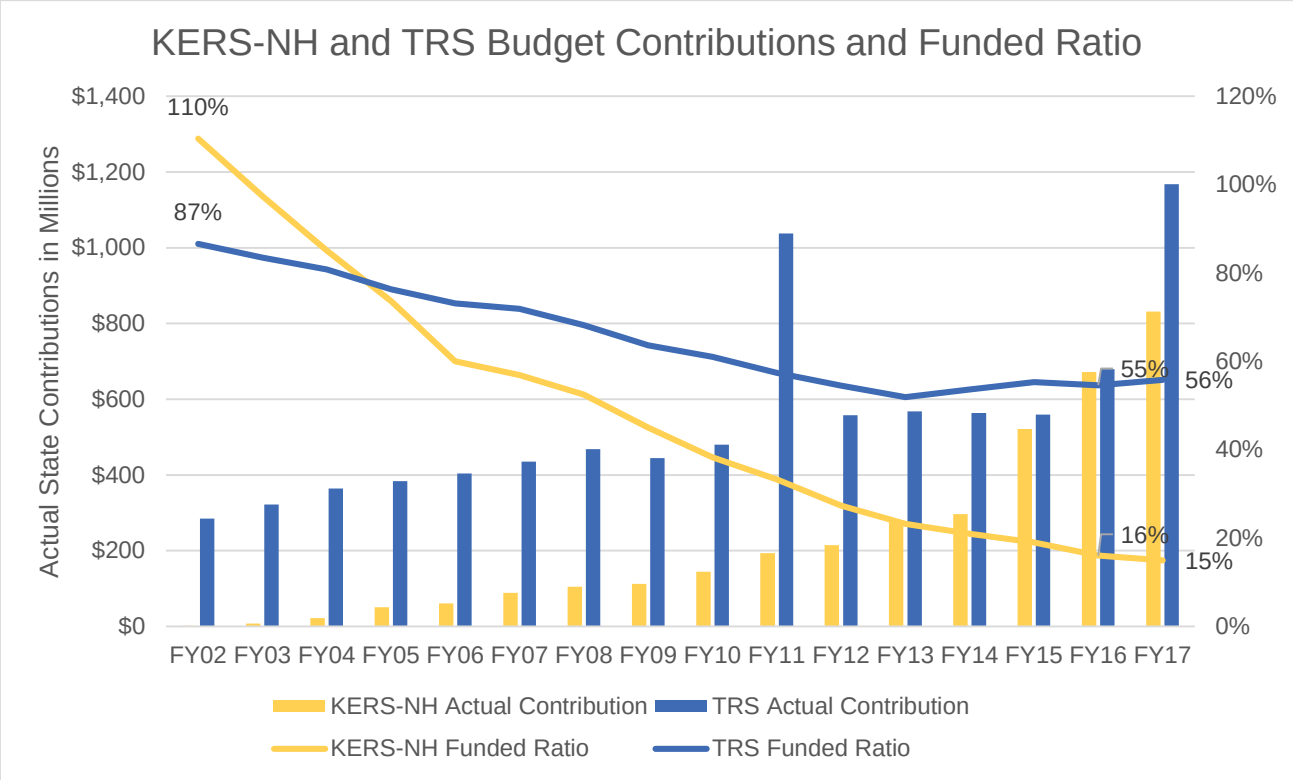
Figure 10



Source: Commonwealth of Kentucky Office of State Budget Director budget documents; Bureau of Labor Statistics; 2017. Consumer Price Index-Urban Consumers data based on Federal Reserve estimate

Yet to date, even as contributions have trended upwards, the funded status of the largest systems has not improved. Figure below illustrates the gradual increase in the Commonwealth's funding of pensions for TRS and KERS-NH from FY02 onward, the brief spike in FY11 contributions due to the $465.4 million of pension obligation bond proceeds provided to TRS, followed by the significant commitment of additional funds by the Governor and General Assembly in the FY2017 budget. However the increases have not kept pace with the increase in liabilities and the funded ratio for either system has yet to improve.

Figure 11

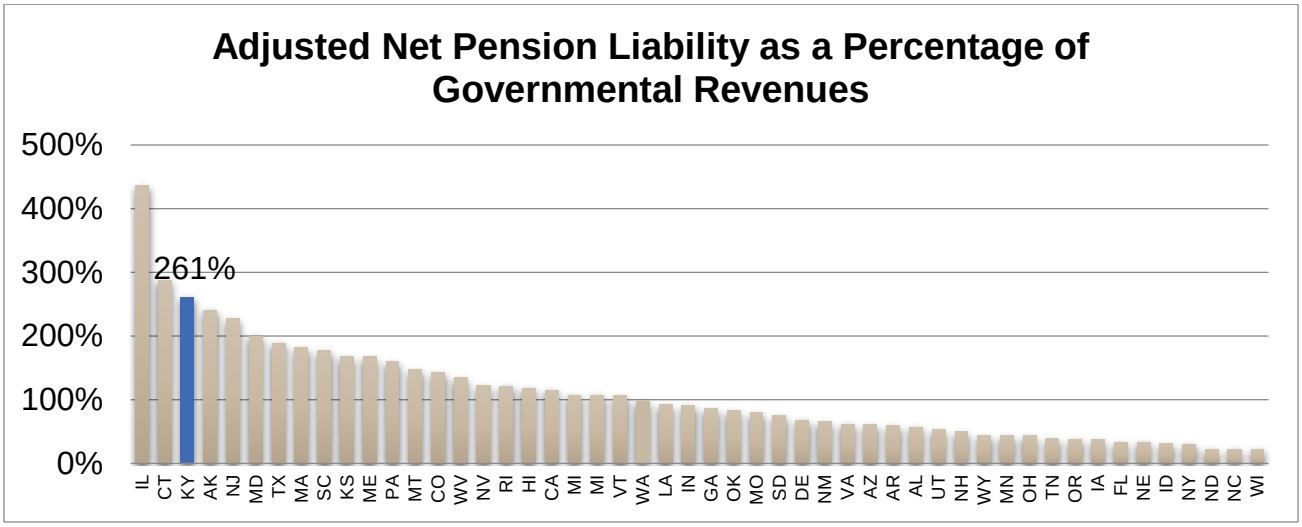


Source: Commonwealth of Kentucky valuation reports for KRS, TRS as of 6/30/16, and Kentucky Office of the State Budget Director data. FY17 funded ratio from Cavanaugh MacDonald data based on the projections and assumptions of the 6/30/16 valuations. FY11 figure includes pension obligation bond proceeds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

The Commonwealth's unfunded or net pension liability is also one of the nation's largest in proportion to the revenues available to pay for the liabilities, when compared to other states.[14] Moody's Investors Service evaluates state and local pension burdens on a comparable basis by adjusting the liabilities using a standardized discount rate based on typical rates for private plans, and by amortizing the liabilities over a standard 20-year period with a level debt service structure. Kentucky had the third-highest net pension liability as a percentage of governmental revenues under the Moody's methodology at 261%. This burden was more than twice the average of 108% and more than three times the median of 85%.

14 The new GASB standards announced in Statements 67 and 68 also changed the basis of pension reporting for financial position from Unfunded Actuarial Liability or Unfunded Accrued Actuarial Liability to Net Pension Liability. The UAL continues to be used but Net Pension Liability is the external reporting standard.

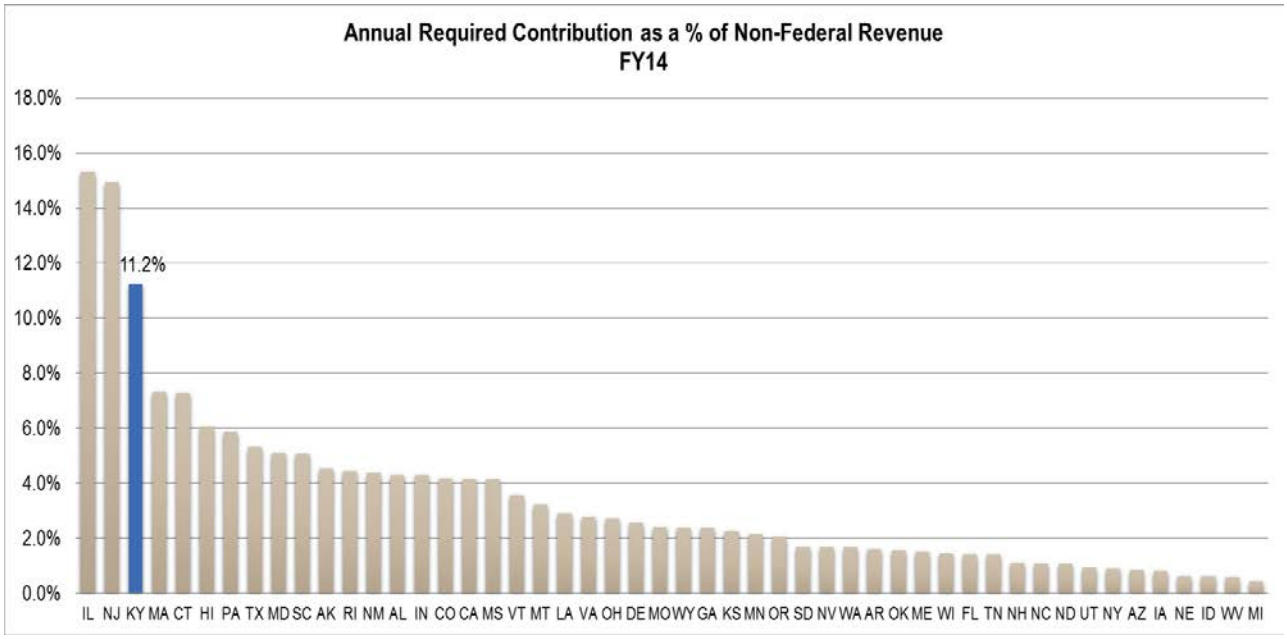
Figure 12



Source: Moody's Investors Service, Fiscal 2015 Pension Medians-US States, October 6,, 2016

Evaluating comparative fiscal pressures from a different perspective, the Center for Retirement Research at Boston College similarly found Kentucky's pension burden to be among the highest in the nation. In this analysis, as shown in Figure 13, the Center for Retirement Research applied a standardized amortization to compare annual required pension contributions in relation to "own-source" or non-federal revenue. From this vantage, Kentucky was found to have the third-highest pension-related budget burden nationally at 11.2%, well above the average of 3.2% and median of 2.4%. In other words, the Commonwealth must dedicate a significantly higher-than-average proportion of its operating budget to pension funding.

Figure 13



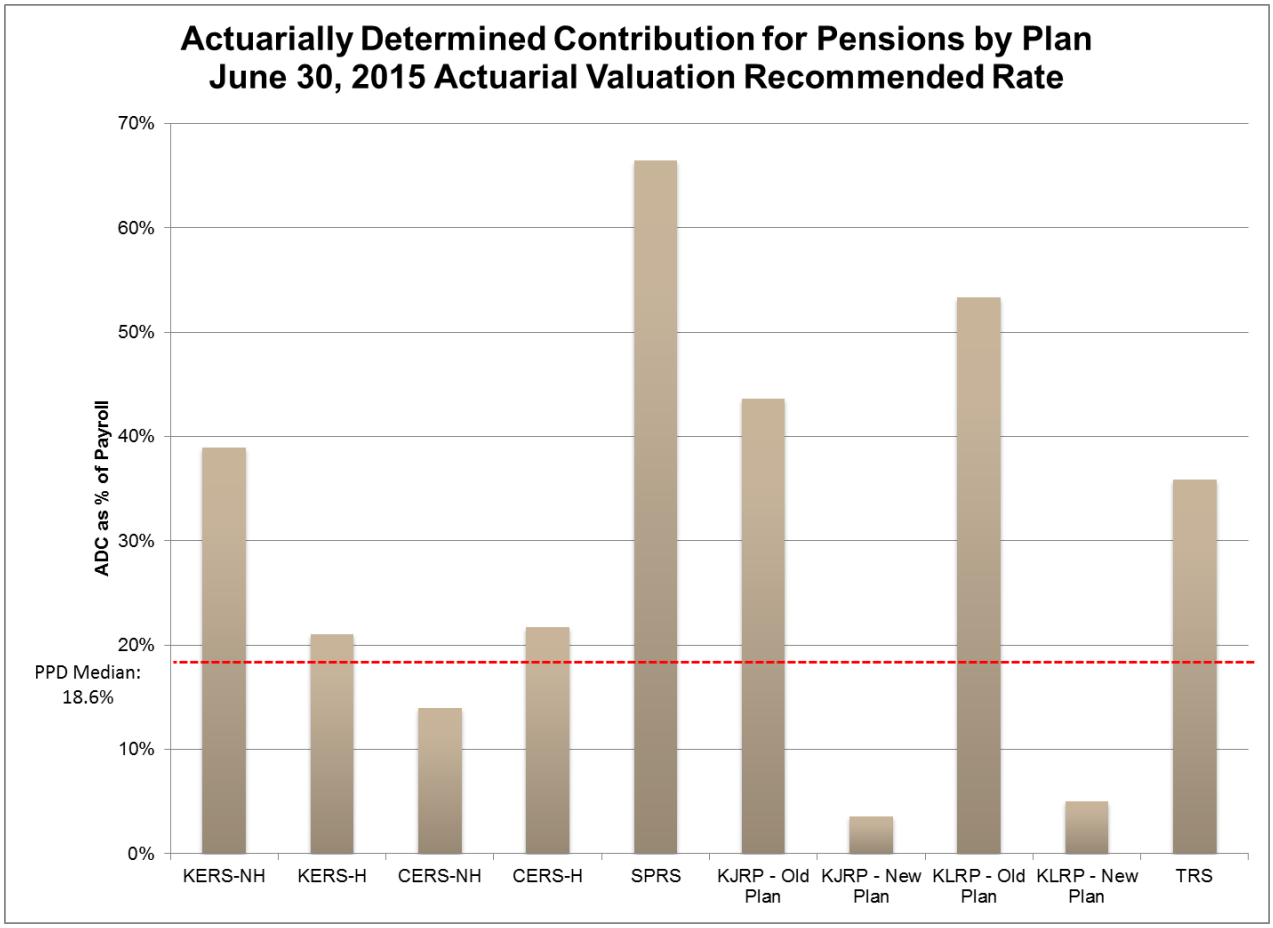
Source: Center for Retirement Research, Will Pensions and OPEBs Break State and Local Budgets?, October 2016

To evaluate pension pressures on a plan-by-plan basis, Figure 14 illustrates the ADC for each plan expressed as a percentage of payroll.[15] This perspective shows the degree to which pension funding burdens overall staffing costs.

According to the Public Plans Data website, the national median ADC as a percentage of payroll costs was 18.6% for FY2015. Although several of Kentucky's plans were near or even below this average, two of the larger Commonwealth plans – KERS-NH and TRS – had actuarially recommended pension contributions as a percentage of pay that were significantly higher than the median.

15 The ADC replaced the ARC in required pension reporting beginning with FY15 for plan sponsors. Therefore analysis of past trends in this report use the ARC, while analysis of data and/or estimates for FY15 forward use the ADC.

Figure 14



Source: System valuation reports, Center for Retirement Research: The Funding of State and Local Pensions, 2015- 2020, June 2016

Of note, the rate for the KRS and TRS plans shown above represents a blended rate for all employees, however, the associated rate for employees hired under less generous Tier 3 benefits in more recent years is significantly lower, due to a reduced normal cost for annual service benefits earned, and dramatically lower unfunded liability amortization. This difference between the relative benefits and funding needs of the old plans and the newer cash balance plan can be seen in the large disparity between the newer and older KJFRS plans also shown above, where the actuary reports on the cash balance plan implemented in 2014 separately.

Credit Rating Pressures

The fiscal pressures generated by the Commonwealth's pension and OPEB liabilities are reflected in its credit ratings, which directly impact the cost of borrowing and provide a measure of the

Commonwealth's overall financial health. S&P recently applied a negative outlook to Kentucky's 'A' issuer credit rating, citing as the cause:

> *"our view there exists at least a one in three chance that funding levels of the commonwealth's pension plans could significantly weaken and associated fixed costs could continue to grow to a level that might significantly pressure budgetary performance and flexibility."*[16]

The rating report also noted liquidity issues for the systems and the ongoing underfunding of the TRS required contribution.

In order to better isolate the impact of pensions on the Commonwealth's rating, we analyzed its pension funding using the Moody's quantitative rating framework, or scorecard. Moody's recently doubled the weight granted to debt and pension funding obligations within its credit analysis from 10% to 20% of the total. Although the Commonwealth has an overall Aa2 issuer rating from Moody's, the indicative rating for the pension component of its scoring suggests a rating of "Baa and below," at least five steps lower than the overall rating. This analysis illustrates that pensions will continue to be a significant drag on the Commonwealth's rating. Baa3 is the lowest investment grade rating.

Table 8

Moody's Rating Calculator - Indicative Pension Score for Kentucky $ in Thousands	
Year	**2014**
Moody's Adjusted Net Pension Liability (ANPL)	41,321,044
Moody's ANPL as % of Governmental Revenues	185.20%
Three-Year Average ANPL	40,620,411
Three-Year Average ANPL as % of Governmental Revenues	182.06%
Governmental Revenues	22,311,579
Indicative Rating	**Baa and Below**

Source: Moody's MFRA (Municipal Financial Ratio Analysis) database. Moody's Adjusted Net Pension Liability is an estimate developed by Moody's to adjust reported liabilities by standardized actuarial assumptions for comparative purposes.[17]

16 S&P Global Ratings, RatingsDirect: Kentucky, January 11, 2017.

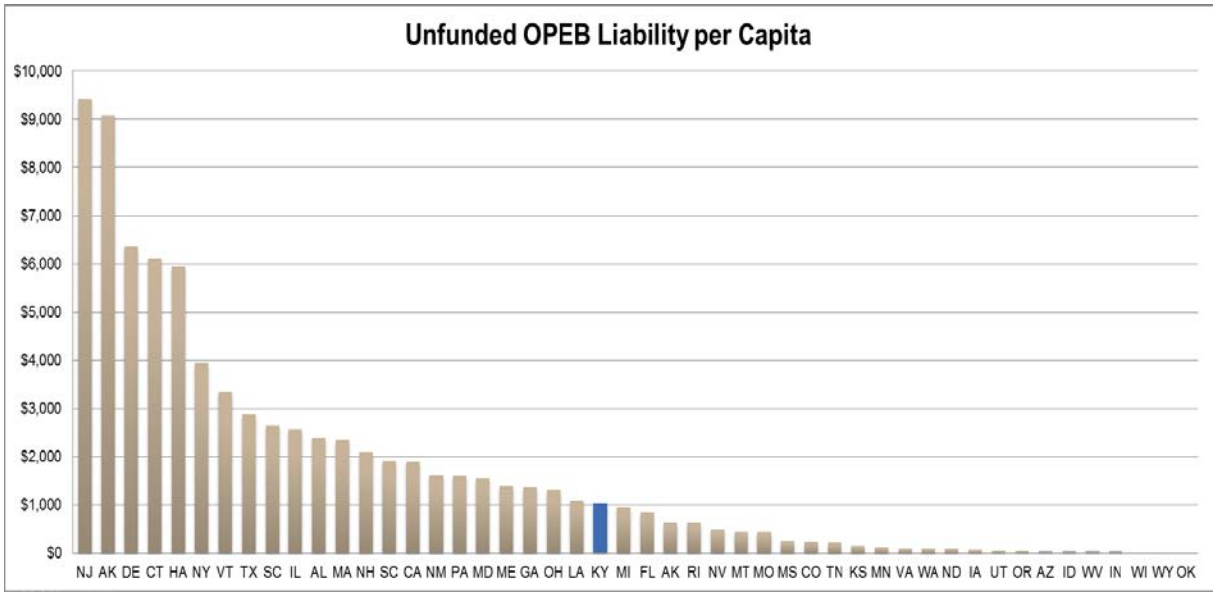
[17] Although Moody's reviewed 2015 adjusted net pension liability data, this was the first year GASB 67/68 were applied, and while Kentucky's relative position in ANPL did not change, the absolute data and ranges varied significantly from prior values. It is not clear that the criteria ranges have been updated to reflect this variance.

Other Post-Employment Benefits (OPEB)

In addition to its pension liabilities, the Commonwealth also has roughly $6 billion of unfunded liability for OPEB, primarily associated with retiree healthcare, adding to Kentucky's overall retiree benefit funding pressures.

This liability is large in dollar terms, but is comparatively moderate in relation to both the pension liability and to the OPEB liability in other states. On a per-capita basis, Kentucky ranked 23rd among states in unfunded OPEB liability per capita in FY2015 at $1,042, just above the median of $896 and below the average of $1,668, as seen in Figure 15.

Figure 15



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 12/31/13 and 6/30/15.

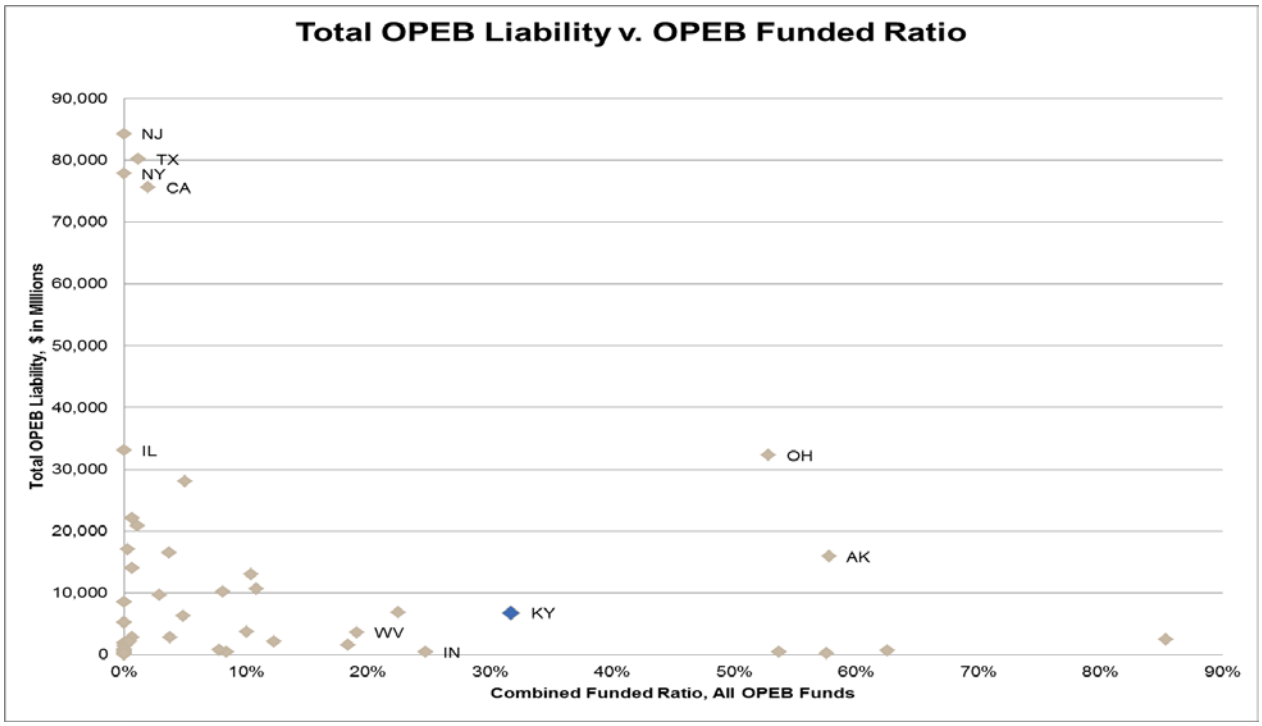
Previous reforms have helped to manage Kentucky's OPEB liability, such as the conversion of the benefit for KRS members hired after 2003 to a fixed inflation-adjusted subsidy per month of service, and retiree medical reforms adopted for TRS members in 2010. Kentucky has also been relatively more proactive in prefunding the OPEB benefit through employer and employee contributions than other states.

Across the 50 states, benefit programs and funding approaches are more diverse for OPEB than for pensions. While some states have replaced traditional pensions with alternative models in recent years, every state has offered some form of defined benefit pension for a significant period of time, and therefore has a liability that it has pre-funded and is amortizing. With OPEB, however, a number of states do not currently make any contribution towards retiree medical care, and may not

have done so historically. A recent Pew study indicated that 15 states provide no contribution or subsidy for pre-Medicare retirees, and 16 states provide no contribution for Medicare-eligible retirees; therefore the only liability associated would be for the implicit subsidy of offering retirees coverage through the active employee health plans, although several states do not even offer that.[18] Some other states have adopted the KRS model of providing a fixed dollar contribution for the retiree to use to purchase coverage. In terms of prefunding, only very recently have a majority of states established trust funds to pre-fund OPEB liabilities.

As a result, at least with regard to OPEB funding, Kentucky is comparatively well-positioned, as evidenced in Figure 16 below. Only two states with more total OPEB liability had a higher funded ratio than Kentucky in FY2015. Every contiguous state other than Ohio had a lower funded ratio. Three states with much higher total OPEB liability than Kentucky have not dedicated any assets toward OPEB liabilities.

Figure 16



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.

18 The Pew Charitable Trusts and the John D. and Catherine T. MacArthur Foundation, State Retiree Health Plan Spending, May 2016. The "implicit subsidy" concept reflects that the average healthcare cost for retirees, who tend to be older, will be higher than for active employees. When retirees are permitted to continue in an active employee plan for the same cost attributed to actives, this practice implicitly provides a subsidy to the retirees.

IV. Cash Flow Concerns and Solvency Analysis

As the funded status of Kentucky's retirement systems has eroded, cash flows have also become increasingly pressured. With negative cash flow in the near-term, the systems must routinely liquidate assets in order to pay benefits and operating expenses, which presents challenges for adherence to a long-term asset allocation and investment policy. Ultimately, if negative cash flow is not corrected, the ability to meet payment obligations and maintain solvency is placed at risk.

Cash Flow Analysis

To evaluate this concern, we reviewed historical data for system cash flows, defined as:

- Inflows: employer contributions, employee contributions, dividends and interest
- Outflows: benefit payments, administrative and operating expenses

We also reviewed the data for changes in net plan assets, which included the above as well as investment income, or unrealized gains and losses in asset values (without actuarial smoothing). Of note, achieving investment return assumptions does not automatically provide a cash flow benefit in all cases, since the portions of returns due to increased equity share values or the price of fixed income instruments are not liquid until sold.

As shown in the following tables (Tables 9-18), our analysis indicated that all three of the large Kentucky retirement systems, KERS-NH, CERS-NH, and TRS, have had negative cash flow for at least seven recent years. KERS-NH has experienced severe negative cash flow of over $100 million every year for more than a decade.

Table 9

KERS-NH Pension Fund Cash Flows Inflows + Interest/Dividends - Outflows **($ in 000s)**			
Year	**Inflows**	**Outflows**	**Cash Flow**
FY2006	$321,936	$595,147	$(273,211)
FY2007	374,024	656,773	(282,749)
FY2008	386,497	715,852	(329,355)
FY2009	337,077	825,742	(488,665)
FY2010	325,639	842,938	(517,299)
FY2011	392,623	857,928	(465,305)
FY2012	387,487	878,939	(491,452)
FY2013	454,584	897,532	(442,948)

KERS-NH Pension Fund Cash Flows Inflows + Interest/Dividends - Outflows **($ in 000s)**			
Year	**Inflows**	**Outflows**	**Cash Flow**
FY2014	470,716	914,708	(443,992)
FY2015	686,969	929,816	(242,847)
FY2016	$654,496	$946,406	$(291,910)

The KERS-H plan has experienced negative cash flow each year since FY10.

Table 10

KERS-H Pension Fund Cash Flows Inflows + Interest/Dividends - Outflows ($ in 000s)			
Year	**Inflows**	**Outflows**	**Cash Flow**
FY2006	$35,252	$25,817	$9,435
FY2007	41,302	30,788	10,514
FY2008	43,979	34,012	9,967
FY2009	39,619	39,548	71
FY2010	38,487	39,819	(1,332)
FY2011	42,888	47,298	(4,410)
FY2012	40,641	51,844	(11,203)
FY2013	51,458	52,350	(892)
FY2014	40,001	58,049	(18,048)
FY2015	54,942	60,227	(5,285)
FY2016	$48,824	$62,435	$(13,611)

SPRS, like KERS-NH, has had negative cash flow every year since FY2002.

Table 11

SPRS Pension Fund Cash Flows Inflows + Interest/Dividends - Outflows ($ in 000s)			
Year	**Inflows**	**Outflows**	**Cash Flow**
FY2006	$19,034	$34,970	$(15,936)
FY2007	$22,612	$37,360	$(14,748)
FY2008	23,752	39,589	(15,837)
FY2009	21,414	42,738	(21,324)
FY2010	20,218	45,856	(25,638)
FY2011	27,052	46,937	(19,885)
FY2012	26,613	49,089	(22,476)
FY2013	29,507	50,774	(21,267)
FY2014	35,684	53,453	(17,769)
FY2015	42,974	55,052	(12,078)
FY2016	$35,148	$56,459	$(21,311)

The magnitude of the negative cash flow at CERS-NH is smaller than for KERS-NH and TRS, but nonetheless consistent in recent years, and may be increasing.

Table 12

CERS-NH Pension Fund Cash Flows Inflows + Interest/Dividends - Outflows ($ in 000s)			
Year	**Inflows**	**Outflows**	**Cash Flow**
FY2006	$353,527	$349,521	$4,006
FY2007	419,550	389,263	30,287
FY2008	449,501	429,120	20,381
FY2009	436,352	475,854	(39,502)
FY2010	432,121	494,571	(62,450)
FY2011	521,263	520,596	667
FY2012	520,721	553,899	(33,178)

CERS-NH Pension Fund Cash Flows Inflows + Interest/Dividends - Outflows ($ in 000s)			
Year	**Inflows**	**Outflows**	**Cash Flow**
FY2013	560,358	584,253	(23,895)
FY2014	608,520	615,751	(7,231)
FY2015	592,175	647,071	(54,896)
FY2016	$534,186	$684,385	$(150,199)

The CERS-H plan had consistently positive cash flows for the first six years of the period but has trended downward recently.

Table 13

CERS- H Pension Fund Cash Flows Inflows + Interest/Dividends – Outflows ($ in 000s)			
Year	**Inflows**	**Outflows**	**Cash Flow**
FY2006	$132,702	$104,347	$28,355
FY2007	156,961	119,242	37,719
FY2008	169,767	128,975	40,792
FY2009	160,469	142,444	18,025
FY2010	155,144	140,000	15,144
FY2011	187,691	171,394	16,297
FY2012	160,109	174,187	(14,078)
FY2013	208,201	184,056	24,145
FY2014	211,995	194,021	17,974
FY2015	205,361	204,534	827
FY2016	$194,582	$217,690	$(23,108)

TRS has had negative cash flow in nine of the last ten years, with the sole exception of FY2011 when one-time pension obligation bond proceeds of $465.4 million were received. While TRS negative cash flow was over $600 million in FY2016, we expect this level to be reduced in FY2017 due to an increased appropriation for the employer contribution.

Table 14

TRS Pension Fund Cash Flows Inflows + Interest/Dividends - Outflows ($ in 000s)			
Year	**Inflows**	**Outflows**	**Cash Flow**
FY2006	$1,078,520	$1,055,280	$23,239
FY2007	1,121,620	1,124,714	(3,093)
FY2008	1,163,896	1,194,486	(30,590)
FY2009	1,093,753	1,276,355	(182,602)
FY2010	1,104,859	1,345,950	(241,091)
FY2011	1,692,378	1,427,184	265,195
FY2012	1,240,690	1,510,251	(269,561)
FY2013	1,311,995	1,601,159	(289,164)
FY2014	1,254,832	1,687,794	(432,961)
FY2015	1,314,907	1,773,358	(458,451)
FY2016	$1,235,409	$1,869,583	$(634,174)

The change or net increase/decrease in plan assets was more volatile than the cash flows, depending on investment returns in each year. Overall, in addition to the severe downturn in FY2009-FY2010, each of the large systems had additional years of decreasing plan assets.

KERS-NH had eight years of declines, including substantial losses in FY08-FY09 and declines for the past five consecutive years.

Table 15

KERS-NH Pension Fund Net Increase/ (Decrease) in Plan Assets ($ in 000s)			
Year	**Additions**	**Deductions**	**Changes in Net Position**
FY2006	$672,649	$595,147	$77,502
FY2007	989,155	656,773	332,382
FY2008	(436)	715,852	(716,288)
FY2009	(646,526)	825,742	(1,472,268)
FY2010	762,839	842,938	(80,099)
FY2011	897,668	857,928	39,740
FY2012	322,615	878,939	(556,324)
FY2013	683,973	897,532	(213,559)
FY2014	732,245	914,708	(182,463)
FY2015	679,308	929,816	(250,508)
FY2016	$598,916	$946,406	$(347,490)

The CERS-NH Pension Fund had a net decrease in half of the past ten years, including the past two years.

Table 16

CERS-NH Pension Fund Net Increase/ (Decrease) in Plan Assets ($ in 000s)			
Year	**Additions**	**Deductions**	**Changes in Net Position**
FY2006	$647,298	$349,521	$297,777
FY2007	1,009,736	389,263	620,473
FY2008	47,919	429,120	(381,201)
FY2009	(624,871)	475,854	(1,100,725)
FY2010	984,051	494,571	489,480
FY2011	1,283,559	520,596	762,963

CERS-NH Pension Fund Net Increase/ (Decrease) in Plan Assets ($ in 000s)			
Year	**Additions**	**Deductions**	**Changes in Net Position**
FY2012	391,539	553,899	(162,360)
FY2013	999,511	584,253	415,258
FY2014	1,348,330	615,751	732,579
FY2015	559,724	647,071	(87,347)
FY2016	$384,981	$684,385	$(299,404)

The TRS Pension Fund also had a net decrease in half of the past ten years and the past two years.

Table 17

TRS Pension Fund Net Increase/ (Decrease) in Plan Assets ($ in 000s)			
Year	**Additions**	**Deductions**	**Changes in Net Position**
FY2006	$1,386,694	$1,055,280	$331,413
FY2007	2,768,457	1,124,714	1,643,744
FY2008	(151,412)	1,194,486	(1,345,898)
FY2009	(1,284,454)	1,276,355	(2,560,809)
FY2010	2,287,204	1,345,950	941,255
FY2011	4,101,171	1,427,184	2,673,987
FY2012	1,176,766	1,510,251	(333,485)
FY2013	2,912,846	1,601,159	1,311,687
FY2014	3,671,556	1,687,794	1,983,762
FY2015	1,729,918	1,773,358	(43,440)
FY2016	$633,284	$1,869,583	$(1,236,299)

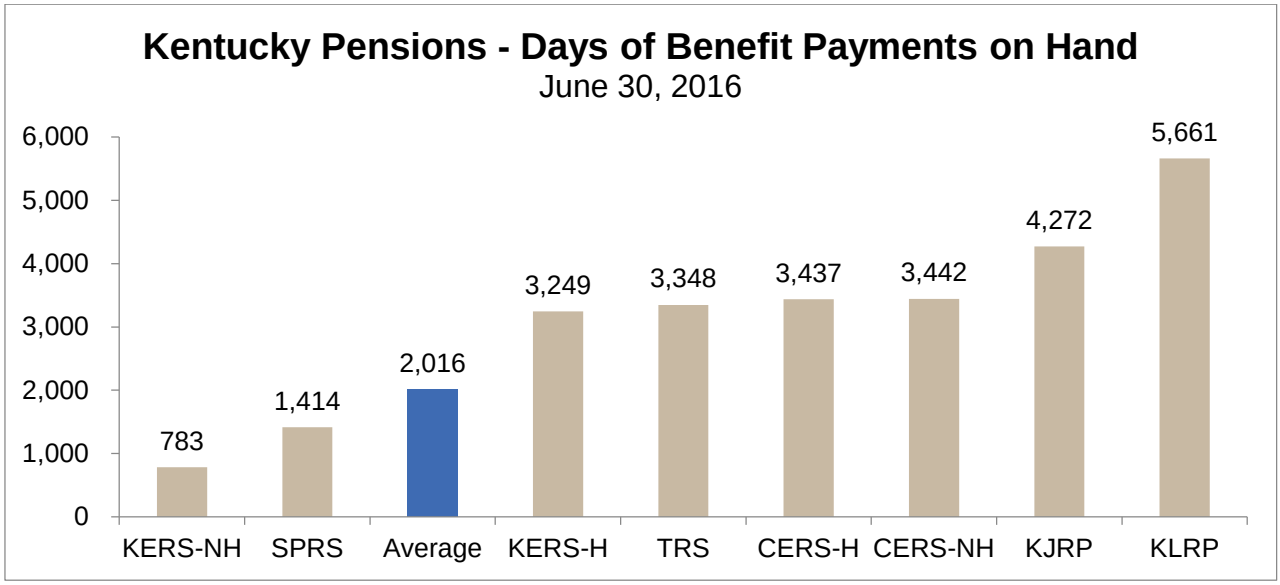
The smaller systems had generally more favorable change in plan assets history, although every system other than KJFRS had declining plan assets for FY2012, FY2015 and FY2016.

Table 18

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

The high-risk condition of the KERS-NH and SPRS systems in particular is highlighted by comparing the fund net position at year-end FY2016 to the annual benefit payments in that year in Figure 17. The KERS-NH fund had assets of just under $2.0 billion available, which represented 783 days of benefit payments on hand, far below the Kentucky average of 3,201 days. Considering that KERS-NH lost $2.2 billion in plan assets in FY2008-FY2009, it is apparent that the system's present inability to maintain assets for a pre-funded retirement system is acutely vulnerable to another sharp downturn. SPRS has a higher balance but is still significantly below the state average and below what might be viewed as healthy liquidity.

Figure 17



Source: Commonwealth of Kentucky FY2016 annual financial reports for KRS, TRS, KJFRS.

The actuarial amortization estimates from the June 30, 2016 valuation illustrate that negative cash flows are projected to continue for the major systems, KERS-NH and TRS. Based on the assumptions, contribution requirements, and amortization schedule of the June 30, 2016 KERS-NH valuation, as illustrated in Table 19, negative cash flows are projected to continue until the growth in benefit payments begins to level off while the amortization schedule for the unfunded liability continues to increase.

Table 19

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)

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**
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: Unlike prior cash flow tables, does not include dividends/interest or other investment earnings.

TRS is also projected to experience significant negative annual cash flows based on the assumptions, contribution requirements, and amortization schedule of the June 30, 2016 valuation report, 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. As cited previously, according to NASRA, "over time, a majority of revenues of a typical public pension fund come from investment earnings."[19] However, the recurring negative cash flows of the magnitude projected for TRS, illustrated in Table 20 indicate the level of risk and stress associated with a plan that is 55% funded.

Table 20

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)

[19] *National Association of State Retirement Administrators, "Public Fund Survey, Summary of Findings for FY2015," December 2016.*

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**
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: Unlike prior cash flow tables, does not include dividends/interest or other investment earnings.

The negative cash flow for TRS would be greater in future years where:

- The earnings assumption is not met
- Payroll growth is lower than assumed
- Authorized funding levels are lower than the ADC

Further, the pace of progress under the current funding policy will be slow, even if all assumptions are met. In fact, even if the current assumptions of 6.75% annual investment return and 4% annual payroll growth are achieved and the contribution payment schedule is met in full, the funded ratio of KERS-NH is estimated to continue to decline until FY2023, and is not estimated to reach even a 20% funded status until 2030. A more conservative amortization schedule for paying down unfunded liabilities, a level dollar amortization – similar to a standard home mortgage schedule -- would cost significantly more in the short term but would make faster progress in reducing the unfunded liability, would eliminate reliance on changes in payroll as a variable, and would not backload principal payments are much as the current schedule.

Table 21

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	$11,620.2	$11,257.9	12.9%	15.6%
2020	752.6	1,113.1	11,741.1	10,981.7	12.2%	17.9%
2021	793.3	1,117.3	11,788.5	10,642.9	12.0%	20.5%
2022	817.6	1,151.5	11,813.5	10,245.4	11.9%	23.6%
2023	851.9	1,099.4	11,804.5	9,874.7	12.1%	26.5%
2024	879.0	1,134.5	11,766.7	9,442.6	12.4%	29.7%
2025	912.1	1,071.0	11,692.2	9,046.9	13.0%	32.7%
2026	942.7	1,106.9	11,581.0	8,587.5	13.8%	36.1%
2027	976.7	1,040.2	11,427.5	8,166.3	14.9%	39.2%
2028	1,010.4	1,076.1	11,229.1	7,679.9	16.3%	42.7%
2029	1,044.0	1,005.8	10,983.0	7,233.8	18.0%	46.0%
2030	1,080.6	1,041.0	10,682.7	6,721.3	20.1%	49.7%
2031	1,114.8	968.8	10,327.0	6,249.2	22.5%	53.1%
2032	1,154.6	1,003.4	9,906.7	5,709.9	25.5%	57.0%
2033	$1,190.7	$929.8	$9,421.5	$5,211.2	28.9%	60.7%

Source: Cavanaugh MacDonald

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

Solvency Analysis

Given this at-risk funded position, contribution history, and cash flow and liquidity concerns, 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 variables altered included:

- The discount rate, linked to investment return assumptions that can vary widely in practice.
- The assumed rate of increase in payroll, which drives the rate of increase in the assumed employer contribution. If actual payroll decreases or grows at a slower rate than assumed, the funding shortfall will increase in the actuarial model.

- The percentage of the actuarially determined contribution (ADC) contributed, since the full ARC/ADC was not fully funded for KRS for over ten years, and has not yet been budgeted for TRS in over ten years.

A solvency analysis estimating cash flows over a 30-year period based on information from the plan actuary was conducted under these varying assumptions.

KERS-NH Solvency Test Results

- Based on the past pattern of negative payroll growth detailed later in Section IV, payroll growth was assumed to be 0% annually. This is effectively a level dollar amortization and would reduce the risk associated with past negative payroll growth, and the resultant continual back-loading of amortization principal and deterioration in short-term funded ratios.

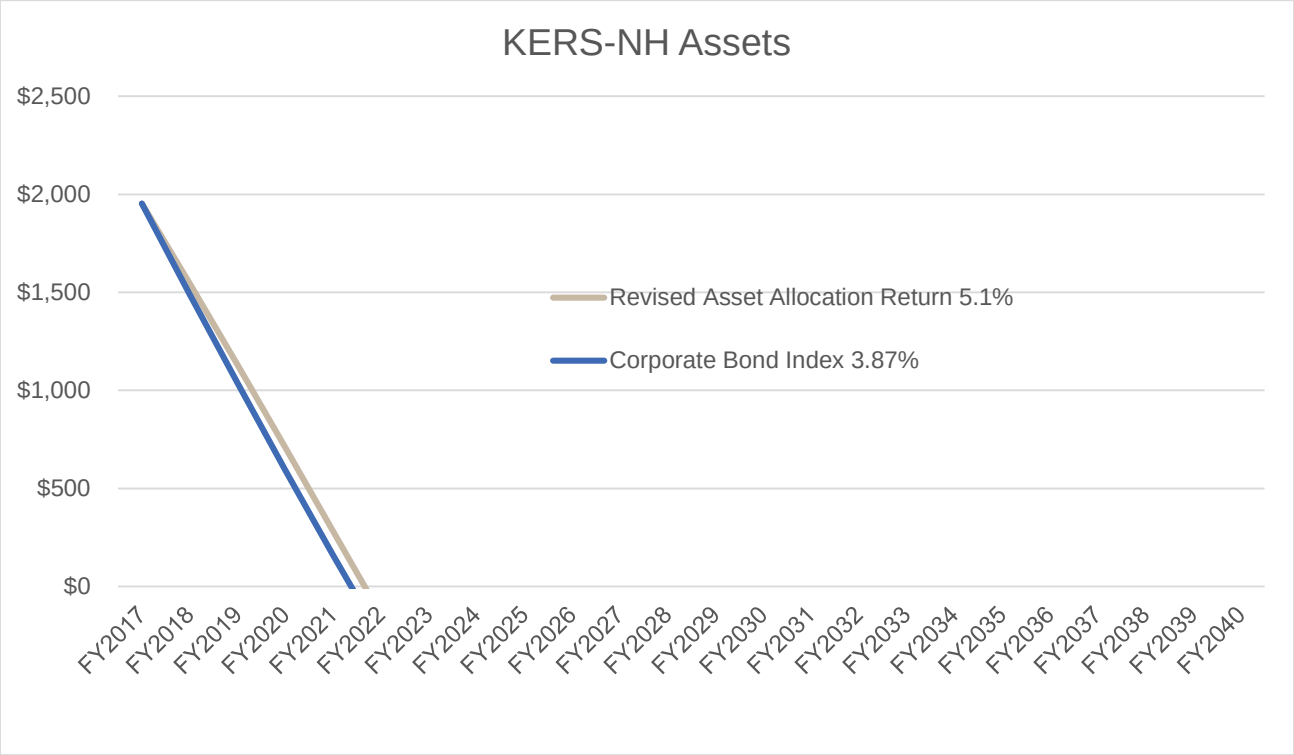
- Several alternative discount rates were assumed:

  - A Revised Asset Allocation rate of 5.1%. KRS has updated its asset allocation approach to reflect the varying degrees of stress and diminished assets of its plans. Based on our understanding of this approach, we developed alternate return assumptions for a 10-year investment horizon and a level of increased liquidity consistent with updated KRS policy, with up to an allocation of 25% short-term bonds and 25% cash. 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.

  - Corporate Bond Index rate. The Citibank corporate bond index rate is used for valuation of private sector pension plans and made available through the Society of Actuaries for these purposes. The appropriate rate for the time period when projected benefits would be paid is applied, and a weighted average rate for the future liabilities was calculated. The weighted average rate across the yield curve as of April 30, 2017 was 3.87%.

- If the past patterns of underfunding the required contribution were followed, the plan would become insolvent by FY2022.

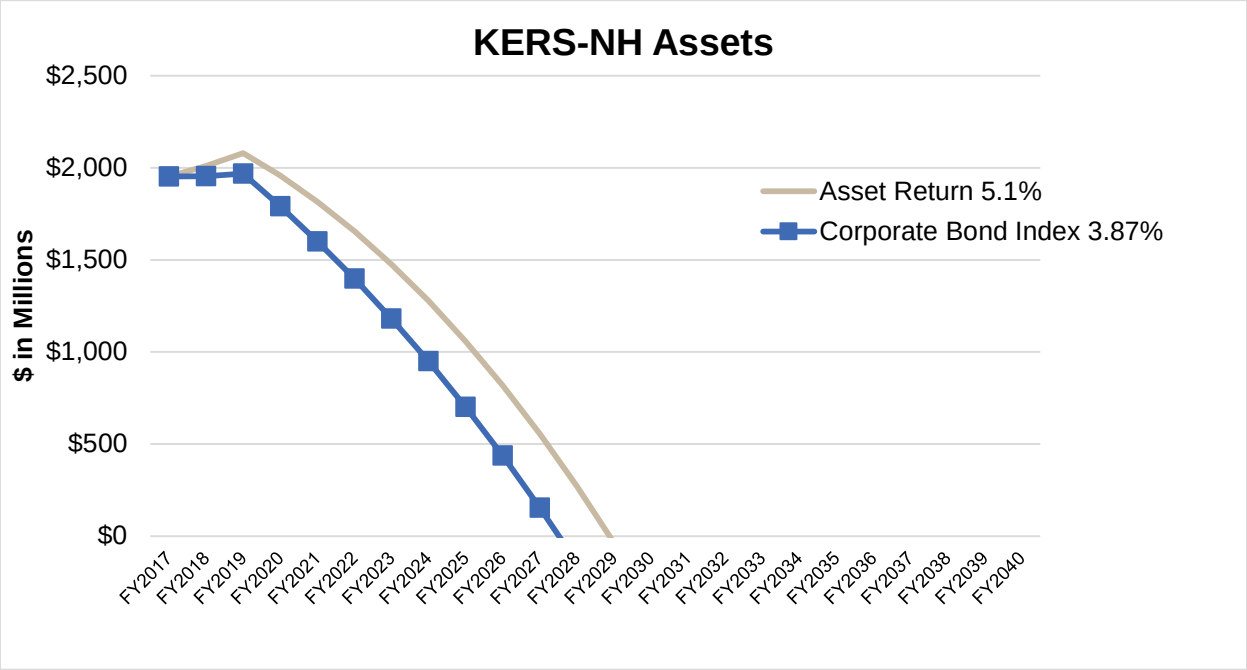
Figure 18



Source: PRM Consulting Group estimates based on data from Cavanaugh MacDonald

- The plan is projected to become insolvent by FY2028 if the FY16 or ADC-equivalent contribution were provided in future years, the plan earned the Corporate Bond Index rate, and payroll growth is 0%, or by FY2029 if the Revised Asset Allocation rate is earned.

Figure 19

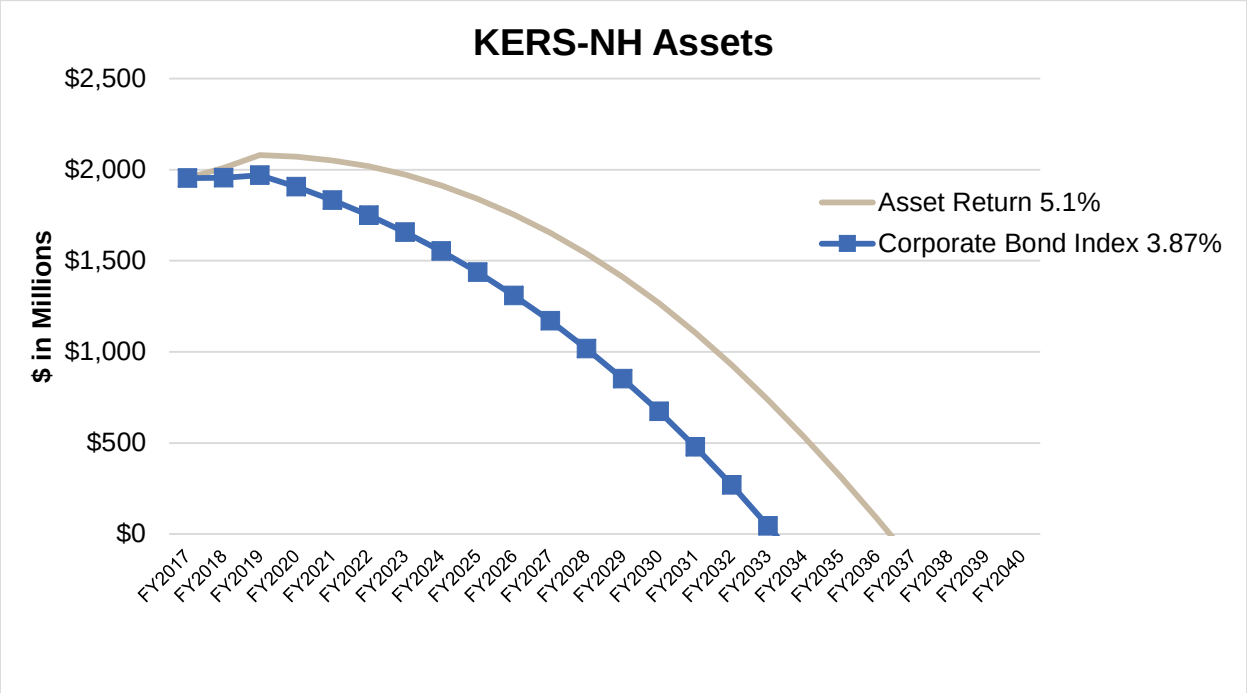


Source: PRM Consulting Group estimates based on data from Cavanaugh MacDonald

Note: 0% Payroll growth and Ultimate contribution of FY2016 budget ($672 Million) annually

- The plan is projected to become insolvent by FY2033 if the average of the budget amounts from FY2016-FY2018 were provided in future years, the plan earned the Corporate Bond Index rate, and payroll growth is 0%, or by FY2037 if the Revised Asset Allocation rate is earned.

Figure 20



Source: PRM Consulting Group estimates based on data from Cavanaugh MacDonald

Note: 0% Payroll growth and Ultimate contribution of 3 year average from FY2016, FY2017, and FY2018 budgets ($787 Million) annually

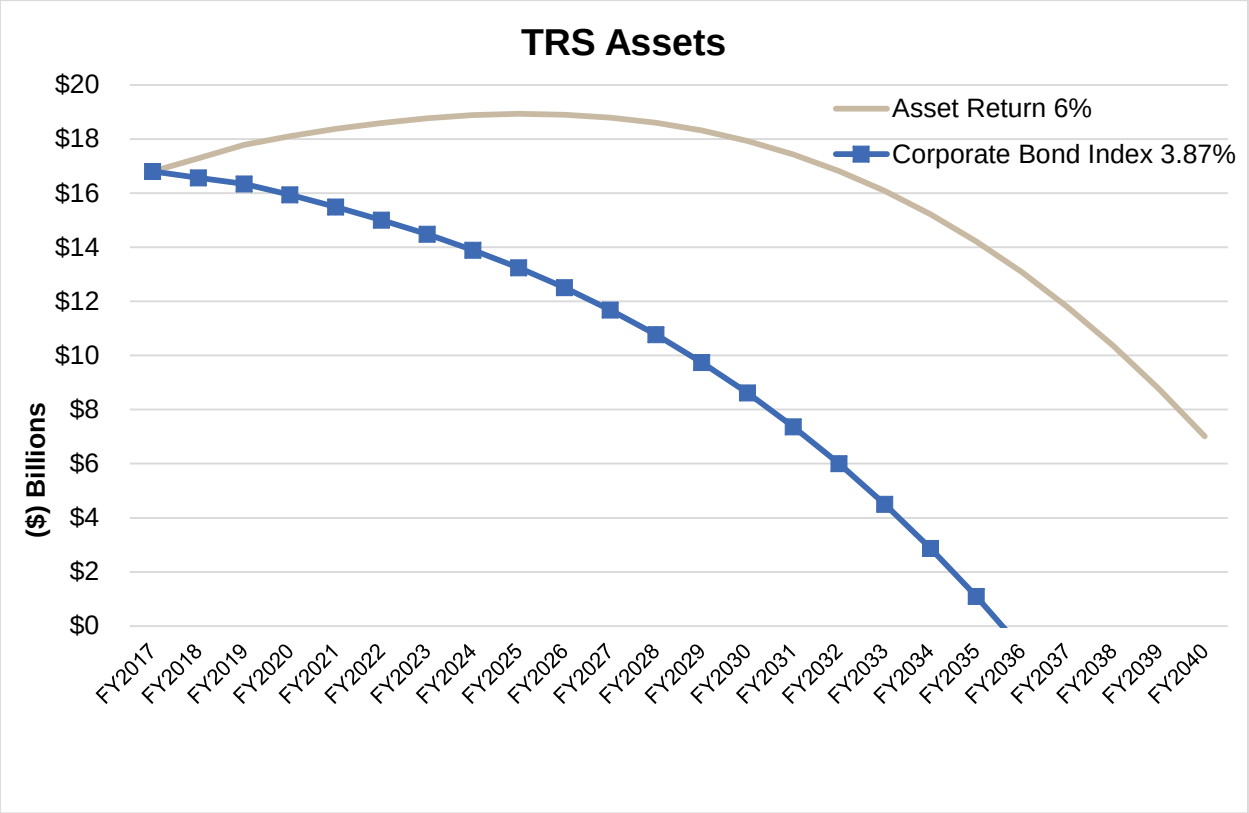
- The amounts appropriated in the FY17-18 budget were significantly higher than the ADC. If these amounts were maintained and the Revised Asset Allocation or Corporate Bond Index rates are achieved every year on average, the plan is projected to remain solvent, even with 0% payroll growth.

TRS Solvency Test Results

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

Figure 21



Source: PRM Consulting Group estimates based on data from Cavanaugh MacDonald

Note: 1% Payroll growth increasing to Ultimate of 2.5%. Ultimate contribution of 3 year average from FY2016, FY2017, and FY2018 budgets ($997 Million) annually

V. Pension Budget Estimates

The Commonwealth's budget contributions towards pensions are projected to continue to escalate by design under the current amortization method. The conservative alternatives covered in this report, such as level dollar amortization or revised actuarial assumptions, would reduce the risks of insolvency, volatility, and continued patterns of underfunding, but would entail significantly greater potential costs in the near- to medium-term.

The estimated General Fund budget associated with the future employer contribution portion of the ADC is presented in the following tables for the KERS, SPRS, and TRS systems. Note that the KERS-NH system in particular has a relatively large proportion of the employer contribution paid by budgetary funds other than the General Fund, including federal grants and road and restricted funds, while also having employer participants that are outside the Commonwealth's budget.

Table 22

	Commonwealth of Kentucky General Fund Budget Estimates TRS and KERS-NH Budget Estimates Baseline June 30, 2016 Valuation and Alternative Assumptions ($ in Millions)					
Year	**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

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
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%.

Table 23

Year	Commonwealth of Kentucky General Fund Budget Estimates SPRS and KERS-NH Budget Estimates Baseline June 30, 2016 Valuation and Alternative Assumptions ($ in Millions)					
	SPRS			KERS-H		
	Published Actuarial Assumptions	Published Actuarial Assumptions with Level $ Amortization	Revised Asset Allocation Discount Rate (6%), 0% Payroll Growth	Published Actuarial Assumptions	Published Actuarial Assumptions with Level $ Amortization	Revised Asset Allocation Discount Rate (5.1%), 0% Payroll Growth
2019	$19.1	$27.9	$32.4	18.1	$24.6	$33.4
2020	19.5	28.5	33.1	18.6	25.3	34.3

Year	Commonwealth of Kentucky General Fund Budget Estimates SPRS and KERS-NH Budget Estimates Baseline June 30, 2016 Valuation and Alternative Assumptions ($ in Millions)					
	SPRS			KERS-H		
	Published Actuarial Assumptions	Published Actuarial Assumptions with Level $ Amortization	Revised Asset Allocation Discount Rate (6%), 0% Payroll Growth	Published Actuarial Assumptions	Published Actuarial Assumptions with Level $ Amortization	Revised Asset Allocation Discount Rate (5.1%), 0% Payroll Growth
2021	20.7	28.9	33.4	19.9	26.1	35.2
2022	21.2	29.6	34.2	20.5	26.9	36.2
2023	22.3	28.7	33.0	21.4	26.2	34.8
2024	22.9	29.5	33.8	22.0	26.9	35.9
2025	23.8	28.0	32.0	22.5	25.5	33.7
2026	24.4	28.7	32.8	23.2	26.2	34.7
2027	25.4	27.2	30.9	23.6	24.5	32.3
2028	26.2	28.0	31.9	24.3	25.3	33.3
2029	27.3	26.5	30.0	24.8	23.7	30.9
2030	28.2	27.4	31.0	25.6	24.4	31.9
2031	29.3	25.7	28.9	26.2	22.8	29.4
2032	30.4	26.7	30.1	27.2	23.7	30.5
2033	$31.4	$24.8	$27.8	$27.8	$22.0	$28.2

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.

Table 24

Year	Commonwealth of Kentucky General Fund Budget Estimates TRS, KERS, and SPRS Total Budget Estimates Baseline June 30, 2016 Valuation and Alternative Assumptions ($ in Millions) Published Actuarial Assumptions	Published Actuarial Assumptions with Level $ Amortization	Revised Discount Rate, Payroll Growth Assumptions
2019	$1,471.8	$2,003.7	$2,095.7
2020	1,497.7	2,032.1	2,161.9
2021	1,566.5	2,086.6	2,235.4
2022	1,649.2	2,152.4	2,326.7
2023	1,735.1	2,162.7	2,357.3
2024	1,795.0	2,188.4	2,421.1
2025	1,858.8	2,154.8	2,422.6
2026	1,920.9	2,173.3	2,486.3
2027	1,985.8	2,133.5	2,484.9
2028	2,051.9	2,151.1	2,549.7
2029	2,121.0	2,109.5	2,549.2
2030	2,193.8	2,127.3	2,617.6
2031	2,267.6	2,085.1	2,618.4
2032	2,346.2	2,103.1	2,689.3
2033	$2,425.3	$2,060.6	$2,691.8

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%.

VI. Sources of Increases in the Unfunded Liability

As recently as FY2002 the KERS-NH plan reported a funded ratio of over 100%, and the TRS plan reported nearly 90% funding. In order to better understand and isolate the subsequent causes of growth in the unfunded liability – and also to inform potential remedies for the future – we conducted a detailed analysis of past actuarial reports in order to categorize, quantify, and illustrate causes.

Table 25 shows a summary of funded status for a majority of Kentucky's eight plans as of June 30, 2005 and eleven years later as of June 30, 2016, a period covering most of the decline in funding. In the aggregate, the plans experienced a growth in unfunded pension liabilities of $25.5 billion when measured using the plan's actuarial valuations.

Table 25

Components of $25.5 Billion Growth in Unfunded Pension Liabilities Amounts in $Millions							
	6/30/2005 6/30/2007 (KJRS & KLRS)			6/30/2016			
	Actuarial Accrued Liabilities	Actuarial Value of Assets	Unfunded Actuarial Accrued Liabilities	Actuarial Accrued Liabilities	Actuarial Value of Assets	Unfunded Actuarial Accrued Liabilities	Growth in Unfunded Actuarial Accrued Liabilities
TRS (Teachers)	$19,135	$14,599	$4,536	$32,028	$17,497	$14,531	$9,995
KERS Non-Hazardous	7,579	5,579	2,000	13,225	2,112	11,113	9,113
KERS Hazardous	439	405	34	937	560	377	343
CERS Non-Hazardous	5,385	5,059	326	11,077	6,535	4,542	4,216
CERS Hazardous	1,796	1,452	344	3,705	2,139	1,566	1,222
SPRS (State Police)	459	354	105	775	235	540	435
KJRS (Judiciary)	241	259	(18)	412	297	115	133
KLRS (Legislators)	65	70	(5)	104	30	74	79

Components of $25.5 Billion Growth in Unfunded Pension Liabilities Amounts in $Millions							
	6/30/2005 6/30/2007 (KJRS & KLRS)			6/30/2016			
	Actuarial Accrued Liabilities	Actuarial Value of Assets	Unfunded Actuarial Accrued Liabilities	Actuarial Accrued Liabilities	Actuarial Value of Assets	Unfunded Actuarial Accrued Liabilities	Growth in Unfunded Actuarial Accrued Liabilities
Total	$35,099	$27,777	$7,322	$62,263	$29,405	$32,858	$25,536

Explanation of the Categories

The categories used to analyze the sources of these increases in the unfunded liability are described in Table 26 below:

Table 26

Major Category	Identified Source of Increase in Unfunded Liability	Explanation
Actuarial	1. Actuarial back-loading; funding the Actuarially Recommended Contribution (ARC) was less than the annual break-even payment on the Unfunded Liability	The actuary's recommended contribution based on the system's funding policy, amortization method, period, and other characteristics, was not large enough to offset interest due on the Unfunded Liability in that year and keep it from increasing. This particularly applies in a level percent of payroll amortization in which, unlike a mortgage with a level payment, payments are back-loaded. This can cause "negative amortization" in the early years of the amortization period, where the unfunded liability is actually scheduled to increase, particularly if the amortization period is reset to a longer period as it was multiple times for KRS and TRS.
Actuarial	2. Actuarial assumption changes	The liability increased due to reductions in the earnings assumption/discount rate, or increases in the life expectancy of plan participants.
Actuarial	3. Plan experience different from assumptions	Workforce hiring and separation patterns and life expectancies were more or less costly than anticipated.
Funding	4. Appropriation was less than the ARC	The employer funding amount provided was less than the amount recommended by the actuary, under the

Major Category	Identified Source of Increase in Unfunded Liability	Explanation
		system's funding policy. This primarily applies to KERS, SPRS, TRS, and KJFRS, as CERS employers routinely paid the required employer contribution.
Investment	5. Investment performance was less than market performance	This measures the extent to which actual investment performance of the retirement system was below representative benchmark portfolio performance, i.e., how much did the retirement system underperform the market.
Investment	6. Market performance was less than the valuation interest rate	This measures the extent to which the representative benchmark portfolio investment performance was less than the assumed investment earnings rate, i.e., how much did the market as a whole underperform the earnings assumption.
COLA	7. COLAs – cost-of-living-adjustments	Post-retirement annuity increases were granted, but were not anticipated in prior funding measurements.

Actuarial Back-loading

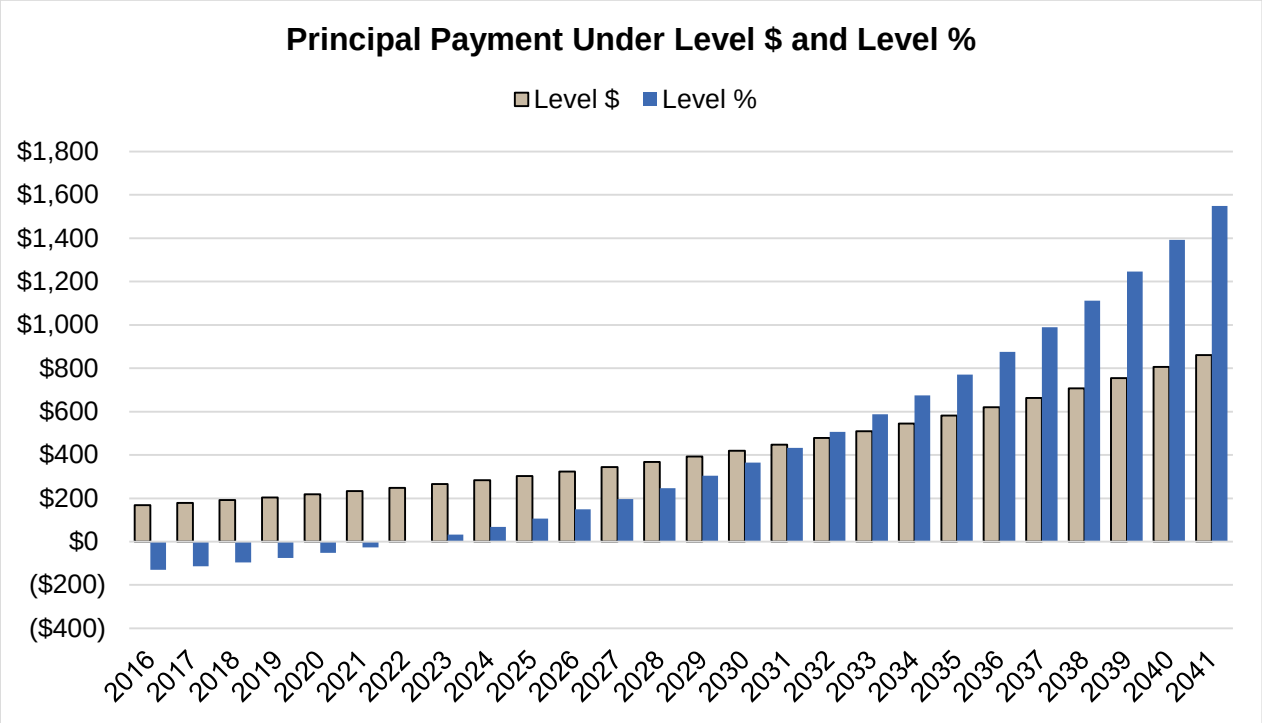
The technical, at times arcane, dynamics and implications of actuarial funding methods and assumptions are not always well understood outside of the actuarial profession, but can have significant impacts on system funding. In Kentucky, one of the specific actuarial approaches in use – while common nationally and widely accepted as one of several alternatives – effectively back-loads system funding when viewed on a multi-year basis, and has contributed materially to the decline in funded status across the Commonwealth's plans.

Like many government pension plans, Kentucky's systems use a "level percent of payroll" method for amortizing any unfunded liabilities that may emerge over time. This is one of several common and accepted amortization methods, and is intended to promote affordability and budgetary stability. Under this approach, a pension plan establishes amortization payment amounts that are not fixed at a set dollar amount, as in a typical home mortgage, but instead are structured to represent a level percentage of payroll. In an open plan with new entrants and regular salary increases, payroll is expected to grow over time. In turn, this means that the planned amortization payments are also assumed to increase in dollar terms over time – which results in smaller payments in the near-term than would be required under the alternative "level dollar" amortization method that sets all payments at the same level year-after-year.

The chart that follows, Figure 22, illustrates the level percentage of payroll and level dollar amortization methods based on the estimated unfunded liability for KERS-NH as of the June 30, 2016 valuation, assuming the 6.75% investment return and 4% payroll growth. The level percentage of payroll amortization is the method assumed in the valuation report, and it is also

specified in state law. This has therefore been the basis of budgetary allocations and forecasts. Each of these methods result in 100% funding by the end of the remaining 26 year amortization period. In the level percentage of payroll approach, however, in the early years of the amortization the interest paid on the unfunded liability is not sufficient, and therefore the unfunded liability continues to increase. This is illustrated on the chart as a negative principal amount, or what is also called "negative amortization." This is also why, as shown in earlier tables, the funded ratio is assumed to decline in the earlier years of the period, with progress primarily occurring in the last few years of the amortization period. As a result of such back-loading, the dollar amount of the unfunded liability actually increases for nearly a decade.

Figure 22



Source: PRM Consulting Group based on data from Cavanaugh MacDonald

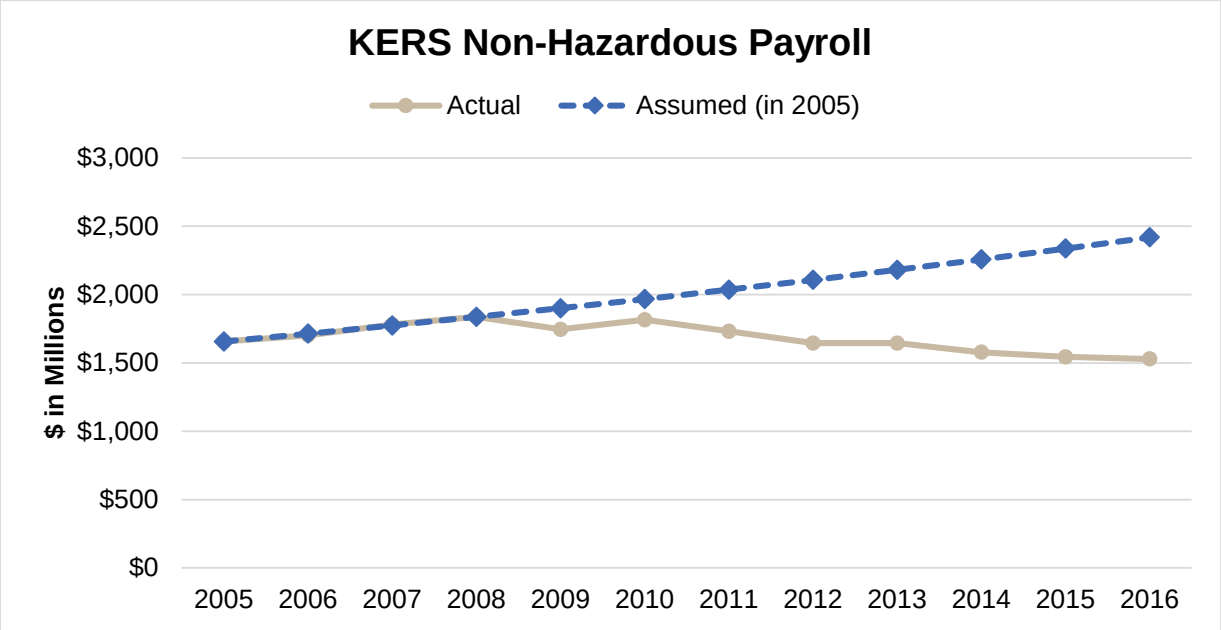
This potential impact of this amortization method is often overlooked, such as when pension reforms are implemented concurrent with a restarted amortization period. The level percent of payroll, while intended to promote budgetary affordability and intergenerational equity, also involves more risk by shifting unfunded liability amortization payments into the future. To the extent that investment earnings, payroll growth, or other inflation assumptions are not met, unfunded liability payments will be shifted further forward, and the risk that the net present value of unfunded liabilities will grow increases. In contrast, the level dollar amortization provides for larger payments sooner, and reduces the risk of growth in the unfunded liability.

The chart above and previous tables also illustrate how progress in the funded ratio for the Kentucky Retirement Systems plans is projected to be much slower under the current level percent of payroll amortization than with a change to a level dollar amortization. Again, this delay in improving the funded ratio and reducing the unfunded liability also leaves the systems more susceptible to the long-term and recurring impacts of other factors that deviate from assumptions.

As stated above, relying on the level percentage of payroll amortization presents the potential for volatility and funding delays associated with deviations in the payroll growth itself. On the one hand, if payroll growth is lower than assumed, this produces favorable experience as the expected future benefit payments based on average final compensation will be lower. On the other, since Commonwealth departments and participating employers in KERS and CERS contribute to the system as an allocated percentage of their payroll, if the actual payroll is less than the actuary's contribution calculation assumed, then the actual contributions will be less than required in the short term. This unfavorable variance is then re-amortized the next year and, due to the back-loading of the amortization, shifts further out into the future.

This issue has particularly impacted KERS-NH. The actuarial valuation has assumed between 3.5% and 4.5% annual growth in payroll in each 30-year schedule prepared since FY2006, and yet covered payroll actually contracted over the period by a compound annual average of -1.1%, in part due to the fiscal pressure caused by accelerating pension needs. The size of the KERS-NH workforce dropped by roughly one-fifth, 19.8%, from 2005 to 2016. The difference between the assumed growth path from the 2005 valuation and the actual payroll is illustrated in the chart below. Again, there are positive and negative offsets to this variance, but the implication is that KERS-NH is consistently underfunding contributions compared to previous expectations, resulting in larger interest accruals on the unfunded liability, and further actuarial back-loading of principal.

Figure 23



Source: KRS annual valuation reports

Actuarial Assumption Changes

A second factor increasing the reported size of Kentucky's unfunded pension liabilities has been adjustments to actuarial assumptions. Like most systems nationally, Kentucky's plans periodically review whether their actuarial assumptions have been consistent with actual experience, and may choose to modify assumptions when variances are identified. Most notably, such assumption changes have included reductions in the investment earnings assumptions. Other modifications, such as the adoption of newer mortality tables to reflect increasing longevity, have also had an impact.

While changes in actuarial assumptions do not, of course, affect the ultimate cost of benefits paid to retirees, they can significantly impact the scale of such obligations as estimated going forward.

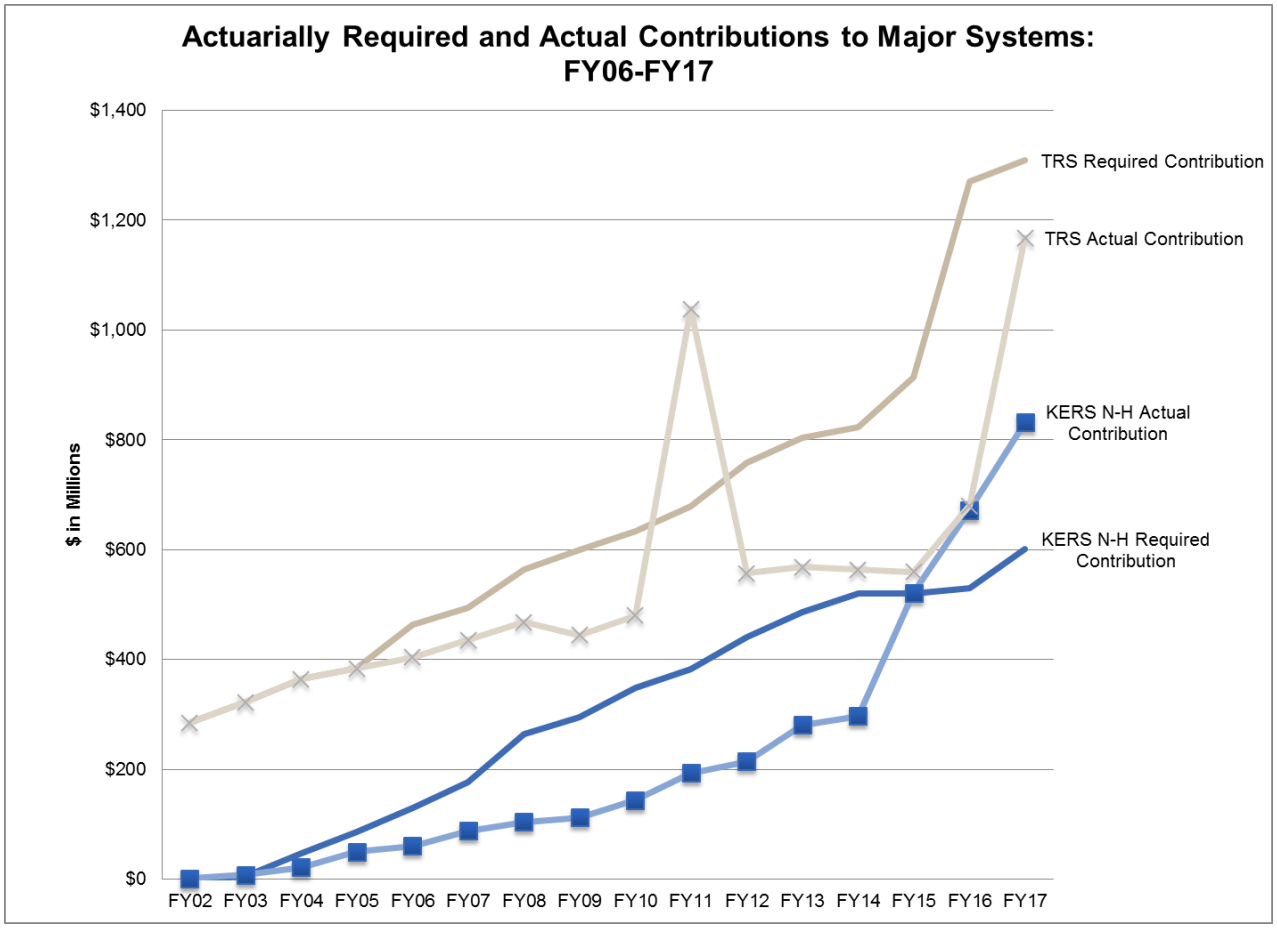
Actuarial Experience

Relatedly, to the extent that actual experience varies from actuarial projections in current years, such variations can result in either favorable or unfavorable results. With regard to mortality assumptions, for example, greater longevity than assumed will result in more years of payments than had been planned. With one exception, the impact of such variances are captured in this category. That exception involves investment returns that differ from each plan's assumptions. Because of the relatively large impact of such investment experience, that factor is tracked within two separate categories that follow – investment performance associated with broader market conditions, and plan investment performance relative to the market.

Appropriation below the ARC

Another major driver of the declining financial health of several of Kentucky's larger has been the historical underfunding of the Commonwealth's Actuarially Required Contributions (ARC). As shown in Figure 24 below, for example, both the KERS-NH and TRS systems received contributions that were hundreds of millions of dollars below the ARC each year across most years of the analysis period.

Figure 24



Source: Commonwealth of Kentucky valuation reports and CAFRS for KRS, TRS, multiple years; Kentucky Office of the State Budget Director

In FY2002, KERS-NH owed no employer contribution due to the net asset surplus at the time. Beginning in FY04, the ARC was underfunded by $26 million and remained underfunded until FY2015, peaking at a funding shortfall of $226.3 million in FY2012, when less than half the required

contribution was made. The Senate Bill 2 reform of 2013 put the Commonwealth on a path to full funding of the ARC, which has now been surpassed with funding greater than the ARC along with more conservative assumptions in the FY2017-FY2018 budget.

For TRS, the Commonwealth maintained full funding of the ARC prior to FY05 before underfunding beginning in FY2006. The magnitude of the underfunding grew from $60.3 million in FY2006 to $590.4 million in FY2016 – more than the entire ARC for KERS-NH, and representing only 53.5% funding of the ARC in that year. This trend was only briefly offset in FY2011 when the Commonwealth issued $465.4 million of Pension Obligation Bonds to provide a one-time restoration of funds that had been diverted from payment of the ARC for TRS pensions in order to cover the pay-as-you-go costs of the TRS Insurance OPEB program. The FY2017 and FY2018 budgets adopted by Governor Bevin and the Legislature provided a significant funding restoration to TRS, although the Actuarially Determined Contribution (ADC) was not quite fully funded.[20]

Investment Performance

The period reviewed for this analysis included the "Great Recession" – the longest and sharpest economic downturn of the post-World War II era. During those recession years, almost every pension plan nationally experienced significant investment losses. Also during the 2005-2016 period of our review, however, several of Kentucky's retirement plans have been criticized for specific investment strategies and fees.

To better understand the relative impacts of both general headwinds in the overall markets and any plan-specific investment underperformance, our analysis disaggregates overall investment results into two distinct categories:

- Plan-specific investment performance relative to annual benchmarks linked to overall market performance each year.
- Overall market performance relative to each plan's assumed investment return rate.

This approach is intended to provide greater insight into the relative impact of these external and internal factors in growth of the unfunded liability.

20 New GASB standards announced in Statements 67 and 68 changed the basis of pension financial reporting from the ARC to the ADC effective with the FY14 financial statements for the retirement systems and FY15 for the Commonwealth.

Cost-of-Living Adjustments (COLAs)

Finally, any improvements to benefits that are provided without commensurate funding will increase a pension plan's unfunded liability. In the early years of this review period, some unfunded COLAs were granted.

Plan-by-Plan Analysis

For each of Kentucky's retirement systems, the relative impact of each of these factors is quantified and discussed below.[21]

Teachers Retirement System

Table 27 compares the funded status of the Teachers Retirement System as of June 30, 2005 with the funded status as of June 30, 2016. While the plan assets increased by $2.9 billion, the plan liabilities increased by $12.9 billion, resulting in an increase in the unfunded actuarial accrued liability of $10 billion.

Table 27

TRS Pension Benefits (Amounts in $Millions)			
	6/30/2005	6/30/2016	Change
Valuation Discount Rate	7.50%	7.50%	0.00%
Actuarial Value of Assets	$14,599	$17,497	$2,898
Actuarial Accrued Liability	$19,135	$32,028	$12,893
Unfunded Actuarial Accrued Liability	$4,536	$14,531	$9,995
Funded Status	76.3%	54.6%	-21.7%

FY2006 Experience

Table 28 shows the experience of the Teachers Retirement Plan in FY2006, which illustrates some of the common factors that caused the increase in the unfunded actuarial accrued liability.

[21] *Tables and figures in this section prepared by PRM Consulting Group based on analysis of valuation reports and additional data from KRS, TRS and KJFRS.*

Table 28

Teachers Retirement Plan - FY2006 Experience (amounts in $ millions)			
	Actuarial Accrued Liability (AAL)	Actuarial Value of Assets (AVA)	Unfunded Actuarial Accrued Liability (UAAL)
As of 6/30/2005	**$19,135**	**$14,599**	**$4,536**
Discount rate	7.50%	7.50%	
FY 2006 Normal Cost	$487	$487	$0
FY 2006 Funding above Normal Cost	$0	$183	($183)
Interest Accrual	$1,433	$1,081	$352
Benefits Paid	($1,038)	($1,038)	$0
Liability (Gain) or Loss	$308	$0	$308
Asset Gain or (Loss)	$0	($454)	$454
As of 6/30/2006	**$20,325**	**$14,858**	**$5,467**
Discount rate	7.50%	7.50%	

The Actuarial Accrued Liability (AAL) grew by $1,190 million as employees earned $487 million in additional benefits due to their accrual of an additional year of service from 7/1/2005 to 6/30/2006. The AAL is the discounted present value of future accrued benefits, and, with the passage of time, employees age one year closer to starting to receive their pensions, resulting in an increase in the liability of $1,433 million. The AAL declined by $1,038 million as benefits were paid out either as pension payments or refunds of contributions. Lastly, the AAL increased by $308 million due to experience losses.

The Actuarial Value of Assets (AVA) increased by $670 million with the influx of new member and employer contributions. Of this total, $487 million was needed to cover the value of benefits earned in the year, resulting in $183 million of funding available towards paying down the Unfunded Actuarial Accrued Liability (UAAL). The assets were expected to earn 7.50%, which would add $1,081 million during the year. In FY2006 the investment performance was 5.28%, resulting in investment earnings of $627 million. The asset loss, measured against the expected increase of $1,081 million, was therefore $454 million.

Overall, the increase in the Unfunded Actuarial Accrued Liability from 6/30/2005 to 6/30/2006 is due to three main factors:

- Asset loss, compared to expected return, of $454 million

- Liability loss, compared to expected growth in liabilities, of $308 million, and
- Insufficient funding to cover interest on the unfunded actuarial accrued liability, of $169 million.

A similar analysis was conducted for each of the following years. In addition to these three factors, the unfunded liability increased due to changes in actuarial assumptions.

Actuarial Assumptions

Effective for the 6/30/2011 valuation, the valuation interest rate was changed from a fixed 7.50% per year to a "Smoothed Interest Rate Methodology". This methodology developed a separate rate to be used for the next 25 years such that when combined with the actual investment performance over the last 5 years, the 30-year period compound rate was equivalent to 7.50%. Benefits paid more than 25 years in the future continued to be discounted at 7.50%. The Smoothed Interest Rate Methodology included a corridor of 0.50% around the ultimate investment return such that if the calculated amount was below 7.00% or above 8.00%, the valuation interest rate limit would apply. The Smoothed Interest Rate Methodology was first adopted for use in the 6/30/2011 valuation and used for the next two years. For the 6/30/2014 valuation the methodology reverted to the fixed 7.50% interest rate.

Table 29 shows the 5-year prior investment performance, the calculated smoothed discount rate before applying the corridor, and the actual rate used in the valuation. If the only assumption change was the change in interest rate, then upon adoption, the liability would be expected to decrease, as the interest rate increased from 7.50% to 8.00% for the next 25 years. However, as shown in the following table, there were several other assumption changes adopted effective as of 6/30/2011, including a change to the mortality table and an increase in the factor used to reflect the impact of converting unused sick leave into additional pension credit. The combined impact of the assumption changes effective 6/30/2011 was an increase in the liability of $751 million.

Table 29

Smoothed Interest Rate Methodology				
	2011	2012	2013	2014
5th prior year	14.6%	-6.5%	-14.6%	13.4%
4th prior year	-6.5%	-14.6%	13.4%	21.6%
3rd prior year	-14.6%	13.4%	21.6%	2.4%
2nd prior year	13.4%	21.6%	2.4%	14.1%
Prior year	21.6%	2.4%	14.1%	17.9%
5-year average	4.76%	2.44%	6.59%	13.70%

Smoothed Interest Rate Methodology				
	2011	2012	2013	2014
Years 1-25 before corridor	8.06%	8.54%	7.68%	6.30%
Years 1-25 after corridor	8.00%	8.00%	7.68%	7.00%

Based on information reported by the plan's actuary in each year's annual valuation report, the liability increased by $1,958 million due to changes in assumptions. The amounts and reasons for the changes in liability are summarized in Table 30.

Table 30

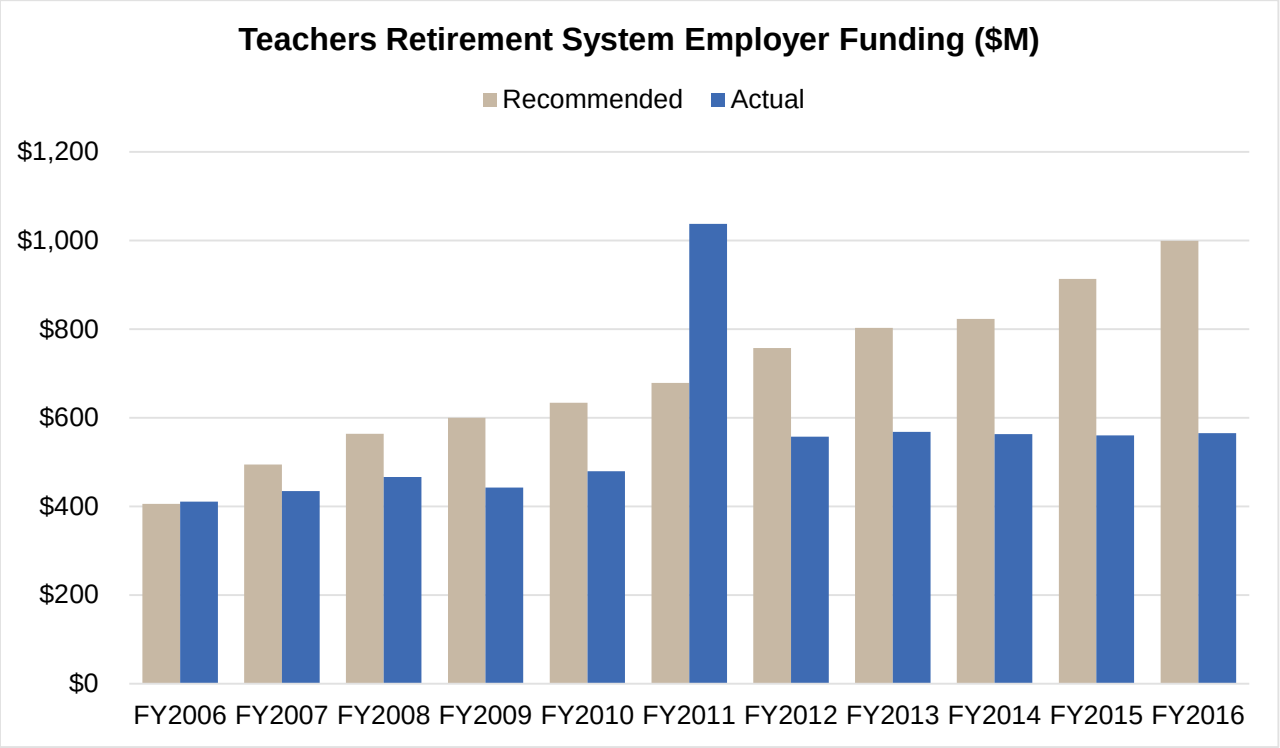
Changes in Actuarial Assumptions and Liability		
Year	**Description of Assumption Changes**	**Increase (Decrease) ($Millions)**
6/30/2011	Smoothed Interest Rate Methodology adopted Unused sick leave loading increased from 1% to 2% Mortality tables changed for both retirees and employees Retirement rates changes Disability rates reduced Withdrawal rates changed	$751
	Actuarial cost method changed	(8)
6/30/2012	Due to Smoothed Interest Rate Methodology	(30)
6/30/2013	Due to Smoothed Interest Rate Methodology	921
6/30/2014	Due to reversion from Smoothed Interest Rate Methodology to fixed Interest Rate	621
6/30/2016	Pay increase assumption reduced	(297)
	Total (all years)	**$1,958**

Actual vs Recommended Employer Funding

Pension plan funding consists of two sources: member (employee) contributions and employer contributions. Member contributions, which are set by statute, are contributed each pay-period. The TRS Board recommends the amount of the employer contributions, based on the calculations performed by the plan's actuary. The actual amount of funding is determined by the Kentucky

legislature. Figure 25 shows that in nine of the last eleven years the amount appropriated was less than the recommended amount.

Figure 25

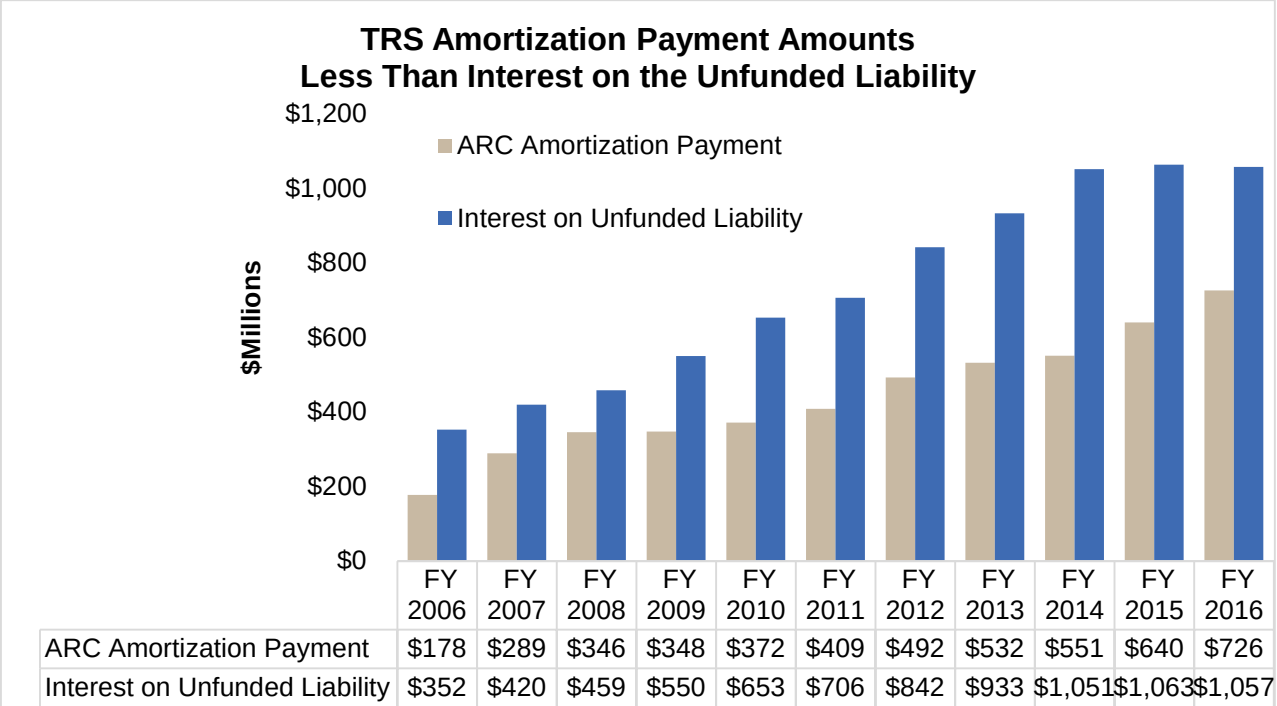


Recommended Employer Funding vs Interest on Unfunded Actuarial Accrued Liability

Even if the amount appropriated by the legislature had been equal to the recommended employer contribution, it would not have been sufficient to prevent the unfunded liability from increasing. The TRS statute sets out the required funding method, which uses the "level percentage of projected payroll" method to spread the funding cost over the amortization period – again, essentially back-loading the payments.

Further, prior to FY2014, the funding policy of TRS was to reset the amortization of the unfunded liability to 30 years every year in an open or rolling amortization. This prevented the ARC from getting to the point in the level percent of payroll amortization period when the unfunded liability begins to get paid down. In FY2014 TRS adopted a closed 30-year amortization for the unfunded liability at that time, and closed 20-year amortizations for new unfunded liabilities in each year. A summary of the amortization payments and interest is shown in Figure 26.

Figure 26

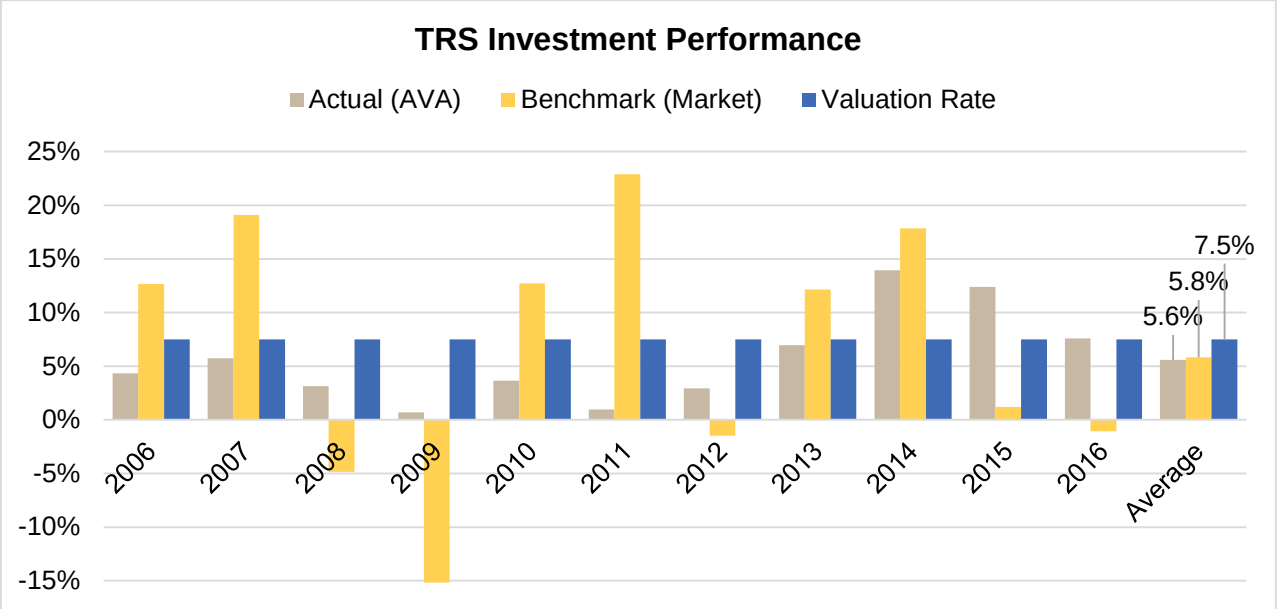


	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
ARC Amortization Payment	$178	$289	$346	$348	$372	$409	$492	$532	$551	$640	$726
Interest on Unfunded Liability	$352	$420	$459	$550	$653	$706	$842	$933	$1,051	$1,063	$1,057

Investment Performance

The actual investment performance, measured based on the plan's Actuarial Value of Assets which recognizes realized and unrealized asset gains or losses over a five year period, was compared to the actual market performance based on a benchmark portfolio and to the plan's valuation interest rate in Figure 27.

Figure 27



The increases in the unfunded liability over the 11 years have been categorized into one of six causes, as shown in Table 31, which are mapped to three major categories: funding, asset performance, and actuarial assumptions.

Table 31

Major Category	TRS - Causes of Increase in Unfunded Liability	Amount
Funding	1. Appropriation was less than the Actuarially Recommended Contribution (ARC)	$1,588
Actuarial	2. Actuarial Back-loading	3,278
Investment	3. Investment performance was less (more) than market performance	1,014
Investment	4. Market performance was less than the valuation interest rate	1,926
Actuarial	5. Actuarial assumption changes	1,958
Actuarial	6. Plan experience different from assumptions	232
	Total	**$9,996**

KERS Non-Hazardous Retirement Plan

Table 32 compares the funded status of the KERS Non-Hazardous as of June 30, 2005 with the funded status as of June 30, 2016. The plan assets decreased by $3.5 billion, and the plan liabilities increased by $5.6 billion, resulting in an increase in the unfunded actuarial accrued liability of $9.1 billion and a decline in the funded status from 73.6% to 16.0%.

Table 32

KERS-NH Pension Benefits (Amounts in $Millions)			
	6/30/2005	6/30/2016	Change
Valuation Discount Rate	8.25%	6.75%	-1.50%
Actuarial Value of Assets	$5,579	$2,112	($3,467)
Actuarial Accrued Liability	$7,579	$13,225	$5,646
Unfunded Actuarial Accrued Liability	$2,000	$11,113	$9,113
Funded Status	73.6%	16.0%	-57.6%

FY2006 Experience

Table 33 shows the experience of the KERS Non-Hazardous Retirement Plan in FY2006, which illustrates the factors that caused the increase in the unfunded actuarial accrued liability for this plan.

Table 33

KERS Non-Hazardous Retirement Plan FY2006 Experience Amounts in $millions			
	Actuarial Accrued Liability	**Actuarial Value of Assets**	**Unfunded Actuarial Accrued Liability**
6/30/2005	$7,579	$5,579	$2,000
Discount rate	8.25%	8.25%	
FY 2006 Benefits earned	$144	$144	$0
FY 2006 Funding above Normal Cost	0	25	(25)
Interest Accrual	613	442	171
Benefits Paid	(588)	(588)	0

KERS Non-Hazardous Retirement Plan FY2006 Experience Amounts in $millions			
	Actuarial Accrued Liability	Actuarial Value of Assets	Unfunded Actuarial Accrued Liability
Expenses Paid	0	(8)	8
Investment Expenses	0	(5)	5
Plan Amendments	133	0	133
COLA granted	118	0	118
Assumption Changes	702	0	702
Data Corrections	8	0	8
Liability (Gain) or Loss	285	0	285
Asset Gain or (Loss)	0	(196)	196
6/30/2006	$8,995	$5,394	$3,601
Discount rate	7.75%	7.75%	

The Actuarial Accrued Liability (AAL) grew by $1,416 million as employees earned $144 million in additional benefits due to their accrual of an additional year of service from 7/1/2005 to 6/30/2006. The AAL is the discounted present value of future accrued benefits and with the passage of time, employees age one year closer to starting to receive their pensions, resulting in an increase in the liability of $613 million. The AAL declined by $588 million as benefits were paid out either as pension payments or refunds of contributions. The liability increased by $133 million from a plan amendment and by $118 million from the granting of a cost-of-living increase for current retirees. The discount rate was reduced from 8.25% to 7.75%, resulting in an increase in the liability of $702 million. Data corrections led to an $8 million increase in the liability, and plan experience different from assumptions resulted in an increase of $285 million.

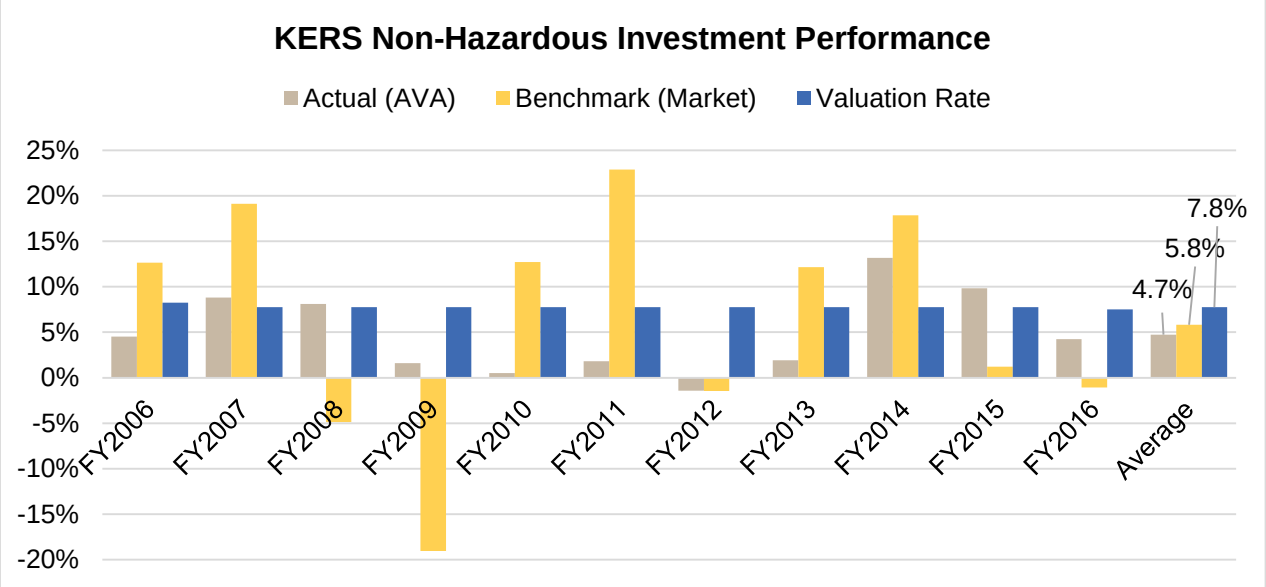
The Actuarial Value of Assets (AVA) declined by $185 million as the benefit payments plus expenses exceeded the sum of investment earnings and member and employer contributions. The assets were expected to earn 8.25%, which would have increased the assets by adding $442 million during the year. In FY2006 the investment performance was 4.52%, resulting in investment earnings of $246 million. The asset loss, measured against the expected increase of $442 million, was therefore $196 million. Employer and member funding of $169 million exceeded the value of new benefits earned of $144 million by only $25 million. After payment of administration and investment expenses of $13 million only $12 million was available to reduce the unfunded liability and was therefore insufficient amount to cover interest on the unfunded liability of $2,000 million.

The increase in the Unfunded Actuarial Accrued Liability from 6/30/2005 to 6/30/2006 is therefore due to five main factors:

- Asset loss, compared to expected return, of $196 million
- Liability loss, compared to expected growth in liabilities, of $285 million, and
- Actuarial back-loading of $158 million.
- Assumption changes and data corrections of $710 million
- Plan amendments, including the COLA of $251 million

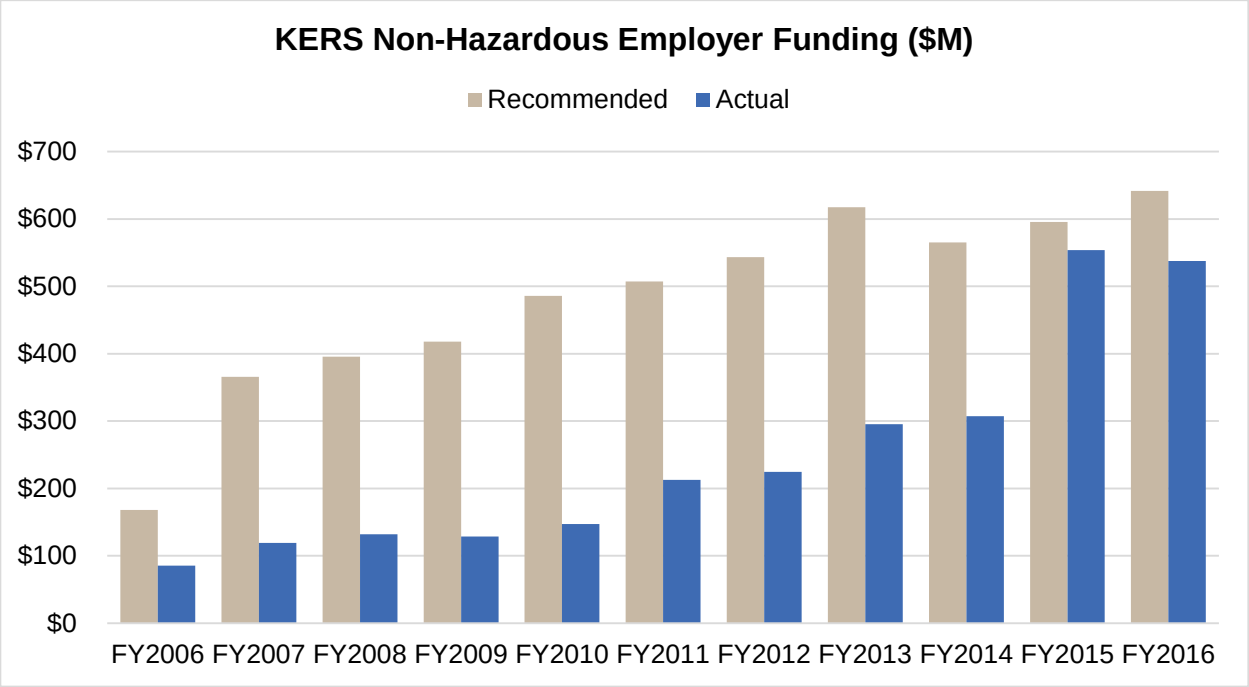
Similar analyses were conducted for each of the successive plan years. The investment performance was analyzed by comparing actual performance to a benchmark of market performance as well as to the plan's valuation interest rate. Figure 28 shows the investment performance over the past 11 years.

Figure 28



Funding was analyzed by comparing the actual amount appropriated to the Actuarially Recommended Contribution and whether the ARC was sufficient to pay interest on the Unfunded Liability. Figure 29 shows that for each year the amount funded was less than the recommended amount.

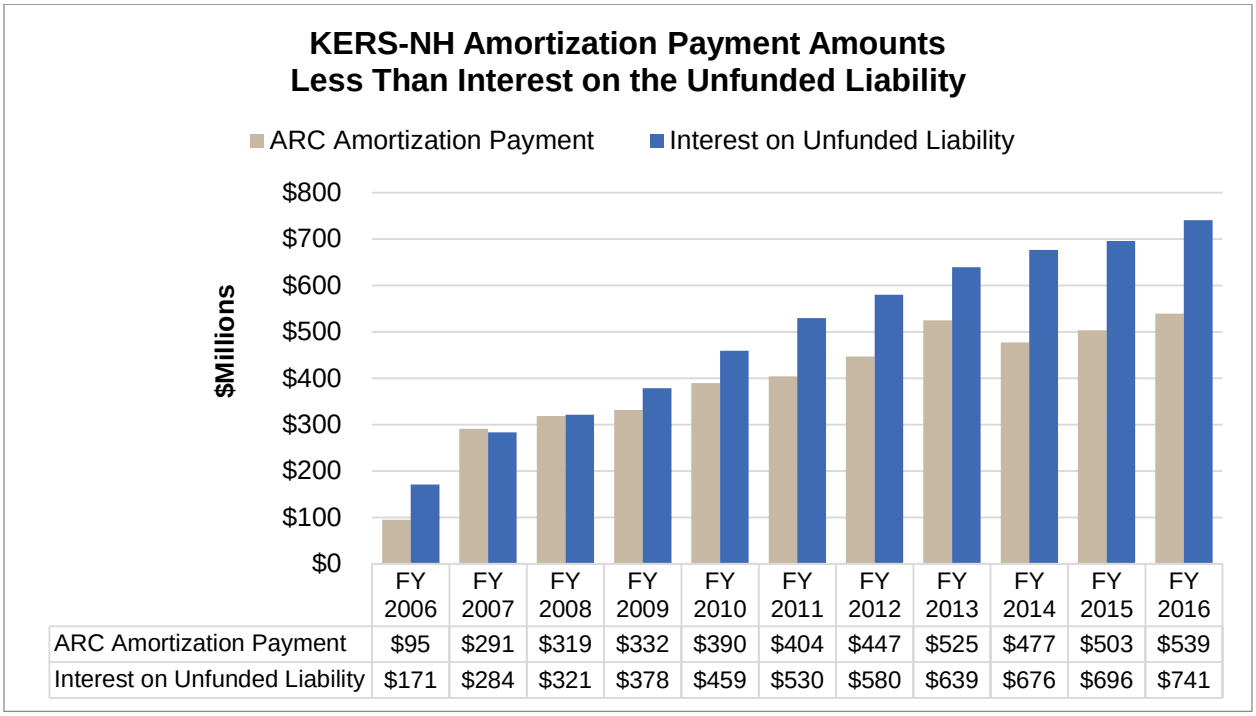
Figure 29



Recommended Employer Funding vs Interest on Unfunded Actuarial Accrued Liability

Even if the amount appropriated by the legislature had been equal to the recommended employer contribution, it would not have been sufficient to prevent the unfunded liability from increasing. The KERS statute sets out the required funding method as the "level percentage of projected payroll" method. In 10 of the 11 years, the amount of the ARC amortization payment was insufficient to cover interest on the unfunded pension liability. In aggregate, the difference between the amortization payments and interest on the unfunded liability was $1,153 million.

Figure 30



	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
ARC Amortization Payment	$95	$291	$319	$332	$390	$404	$447	$525	$477	$503	$539
Interest on Unfunded Liability	$171	$284	$321	$378	$459	$530	$580	$639	$676	$696	$741

The results over the 11 years are summarized in Table 34.

Table 34

Major Category	KERS-NH - Causes of Growth in Unfunded Liability	Amount
Funding	1. Appropriation was less than the Actuarially Recommended Contribution (ARC)	$2,561
Actuarial	2. Actuarial Back-loading	1,153
Investment	3. Investment performance was less than market performance	610
Investment	4. Market performance was less than the valuation interest rate	639
COLA	5. COLAs granted without any additional funding	1,291
Actuarial	6. Actuarial assumption changes	2,319

Major Category	KERS-NH - Causes of Growth in Unfunded Liability	Amount
Actuarial	7. Plan experience different from assumptions	539
	Total	**$9,112**

KERS Hazardous Retirement Plan

Table 35 compares the funded status of the KERS Hazardous plan as of June 30, 2005 with the funded status as of June 30, 2016. The plan assets increased by $155 million, and the plan liabilities increased by $498 million, resulting in an increase in the unfunded actuarial accrued liability of $343 million and a decline in the funded status from 92% to 60%.

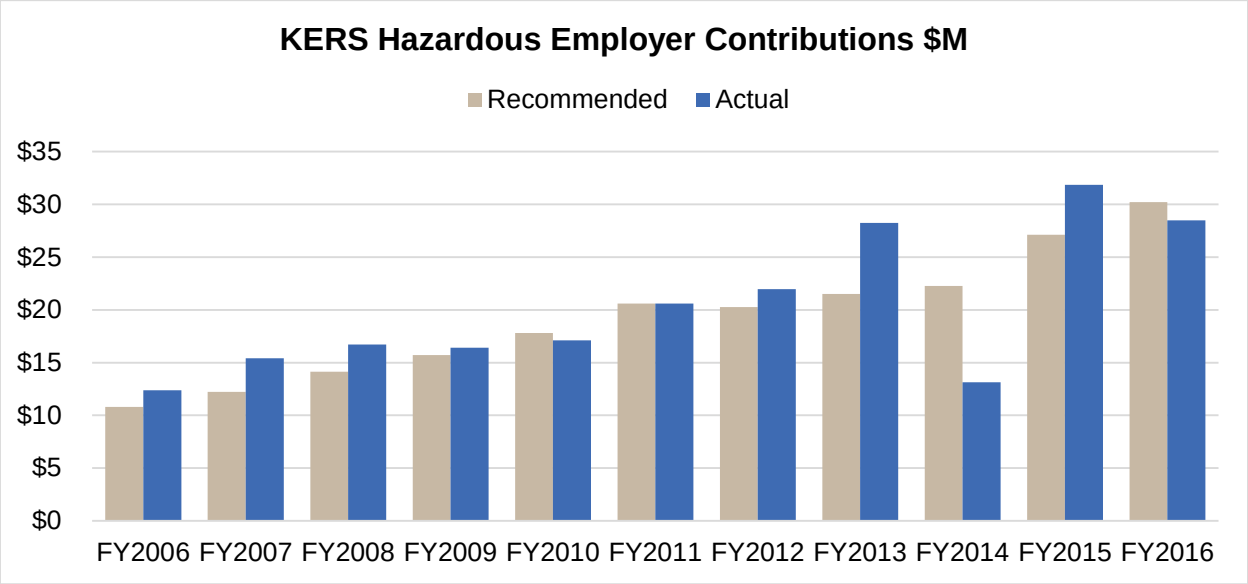
Table 35

KERS-H Pension Benefits Amounts in $Millions			
	6/30/2005	6/30/2016	Change
Valuation Discount Rate	8.25%	7.50%	-0.75%
Actuarial Value of Assets	$405	$560	$155
Actuarial Accrued Liability	$439	$937	$498
Unfunded Actuarial Accrued Liability	$34	$377	$343
Funded Status	92%	60%	-32%

Actual and Recommended Employer Contributions

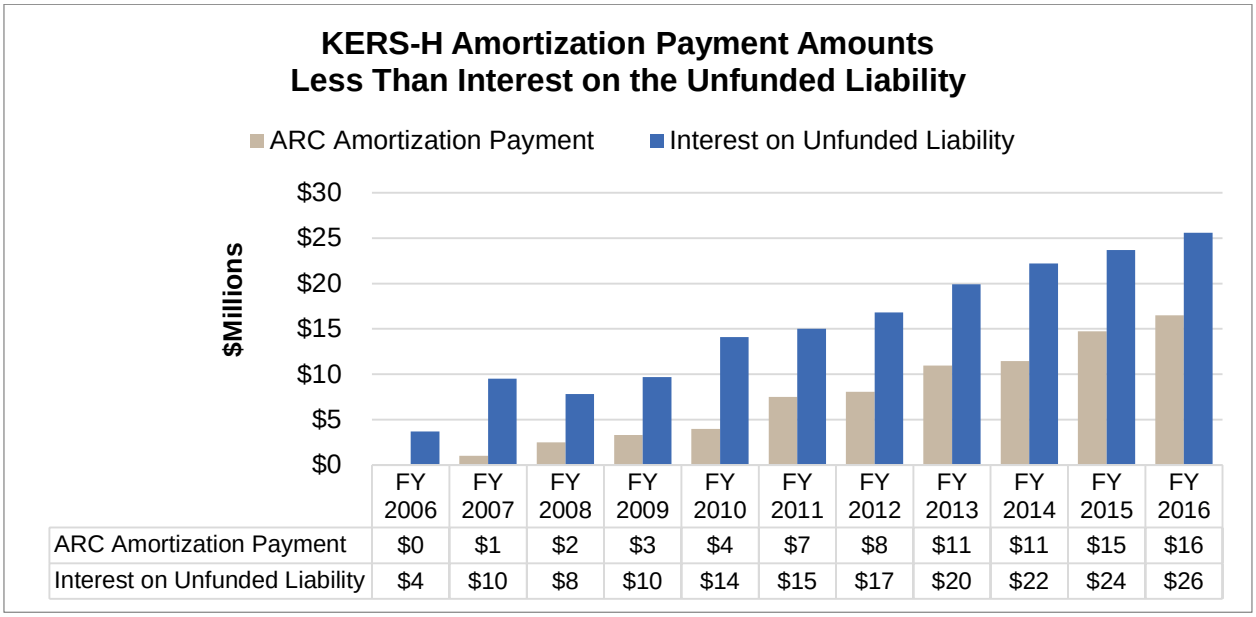
Figure 31 compares the actual employer funding to the recommended contributions. In 8 of the 11 years, the actual amount exceeded the recommended contributions. Over the 11-year period the aggregate amount of employer funding exceeded the recommended amount by $10 million.

Figure 31



In each of the 11 years, the interest on the unfunded liability exceeded the ARC amortization payment. Over the 11-year period the aggregate amount was $89 million.

Figure 32



	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
ARC Amortization Payment	$0	$1	$2	$3	$4	$7	$8	$11	$11	$15	$16
Interest on Unfunded Liability	$4	$10	$8	$10	$14	$15	$17	$20	$22	$24	$26

Investment Performance

The investment performance was analyzed by comparing actual performance to a benchmark of market performance as well as to the plan's valuation interest rate. Figure 33 shows the investment performance over the past 11 years.

Figure 33

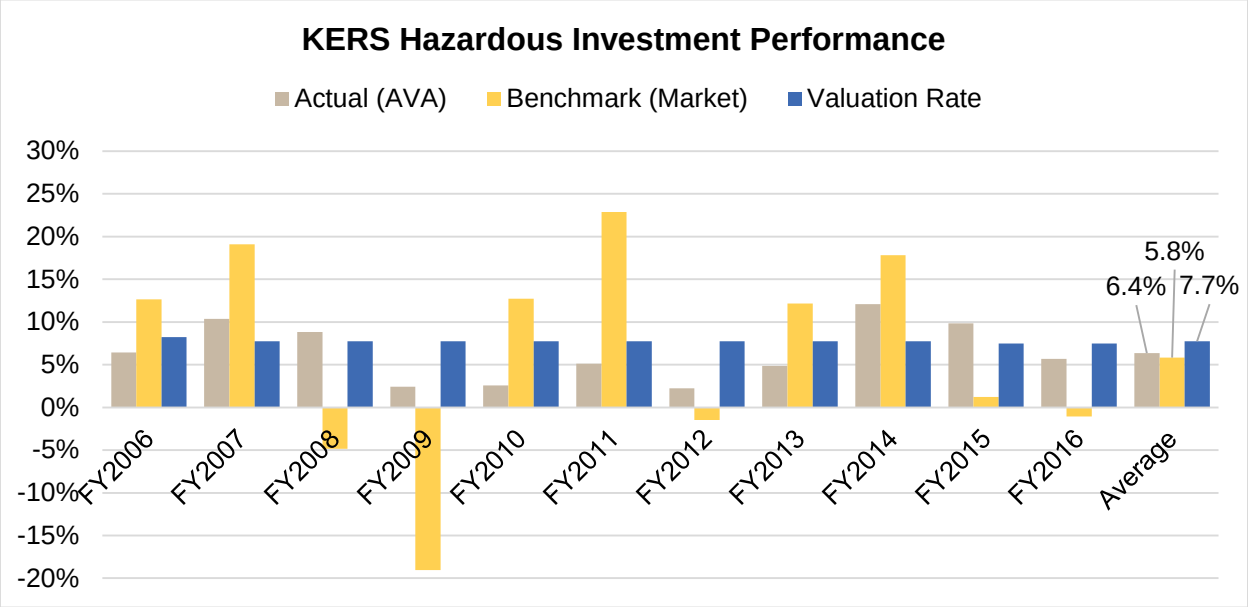


Table 36 summarizes the sources of the increase in the unfunded liability over the 11 years for the KERS Hazardous Retirement System.

Table 36

Major Category	KERS-H - Causes of Growth in Unfunded Liability	Amount
Funding	1. Appropriation was less (more) than the Actuarially Recommended Contribution (ARC)	($10)
Actuarial	2. Actuarial Back-loading	89
Investment	3. Investment performance was less (more) than market performance	(5)
Investment	4. Market performance was less than the valuation interest rate	80

Major Category	KERS-H - Causes of Growth in Unfunded Liability	Amount
COLA	5. COLAs granted without any additional funding	68
Actuarial	6. Actuarial assumption changes	82
Actuarial	7. Plan experience different from assumptions	39
	Total	**$344**

CERS Non-Hazardous Retirement Plan

Table 37 compares the funded status of the CERS Non-Hazardous as of June 30, 2005 with the funded status as of June 30, 2016. The plan assets increased by $1,476 million, and the plan liabilities increased by $5,692 million, resulting in an increase in the unfunded actuarial accrued liability of $4,216 million and a decline in the funded status from 94% to 59%.

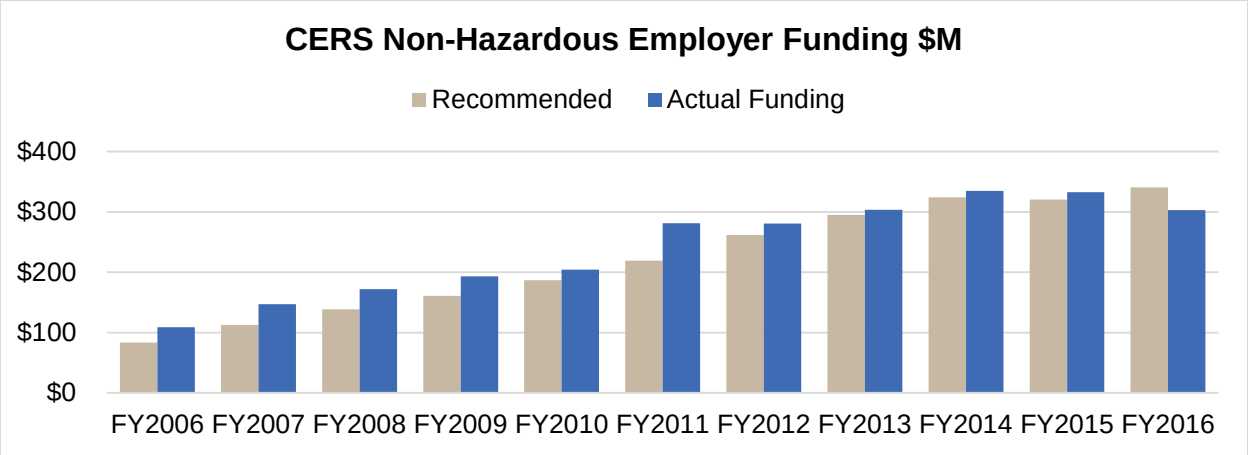
Table 37

CERS-NH Pension Benefits (amounts in $Millions)			
	6/30/2005	6/30/2016	Change
Valuation Discount Rate	8.25%	7.50%	-0.75%
Actuarial Value of Assets	$5,059	$6,535	$1,476
Actuarial Accrued Liability	$5,385	$11,077	$5,692
Unfunded Actuarial Accrued Liability	$326	$4,542	$4,216
Funded Status	94%	59%	-35%

Actual and Recommended Employer Contributions

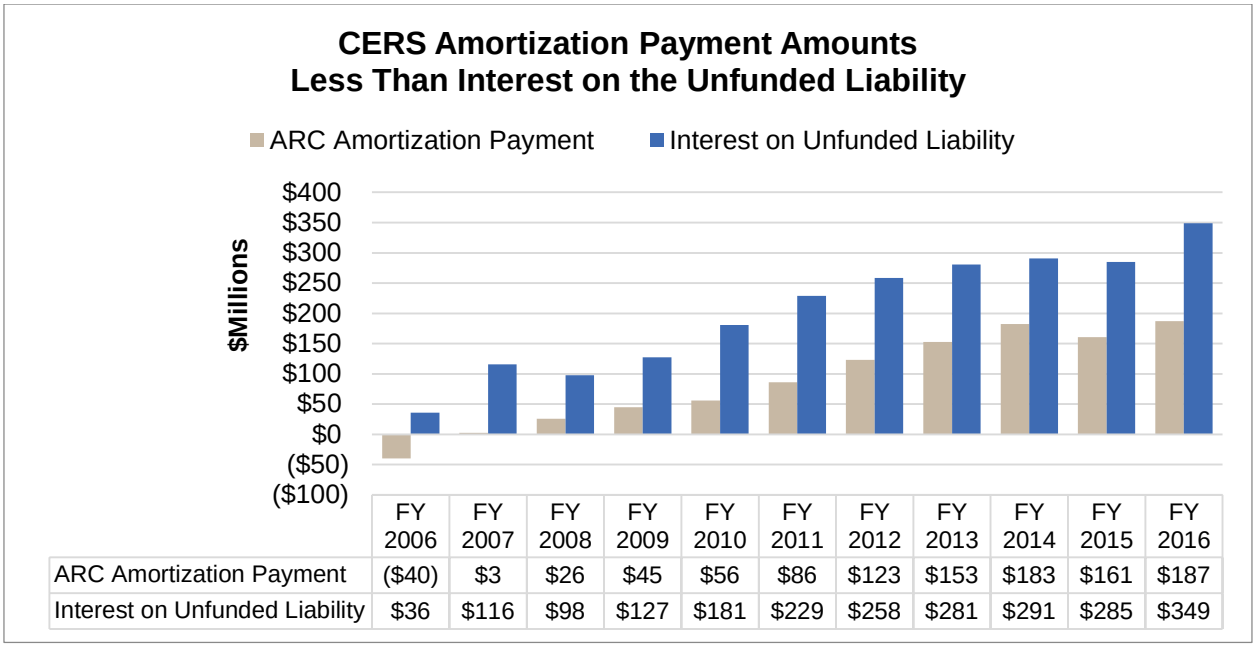
Figure 34 compares the actual employer funding to the recommended contributions. In 10 of the 11 years, the actual amount exceeded the recommended contributions. Over the 11-year period the aggregate amount of employer funding exceeded the recommended amount by $220 million.

Figure 34



In each of the 11 years, the interest on the unfunded liability exceeded the ARC amortization payment. Over the 11-year period the aggregate amount was $1,269 million. In FY2006 the employer contribution was less than the employer Normal Cost rate, resulting in negative amortization.

Figure 35



	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
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

Investment Performance

The investment performance was analyzed by comparing actual performance to a benchmark of market performance as well as to the plan's valuation interest rate. The following chart shows the investment performance over the past 11 years. The investment performance compound annual rate of earnings over the 11-year period, as measured using the plan's Actuarial Value of Assets, matched the benchmark investment return rate of 5.84%. The valuation interest rate was 8.25% for FY2006 and 7.75% for FY2007 and later years, for an average of 7.80%. For purposes of measuring the change in unfunded liability, the benchmark returns were applied to the Actuarial Value of Assets on a year-by-year basis. As the value of the assets increased over the period, and the benchmark returns exceeded the actual returns from FY2010-FY2016, this resulted in a $207 million investment underperformance relative to market. As noted in Figure 36, the benchmark returns did not meet the valuation rate, and this resulted in a further $931 million increase in unfunded liability. Overall, the investment performance resulted in a $1,138 million increase in the unfunded liability.

Figure 36

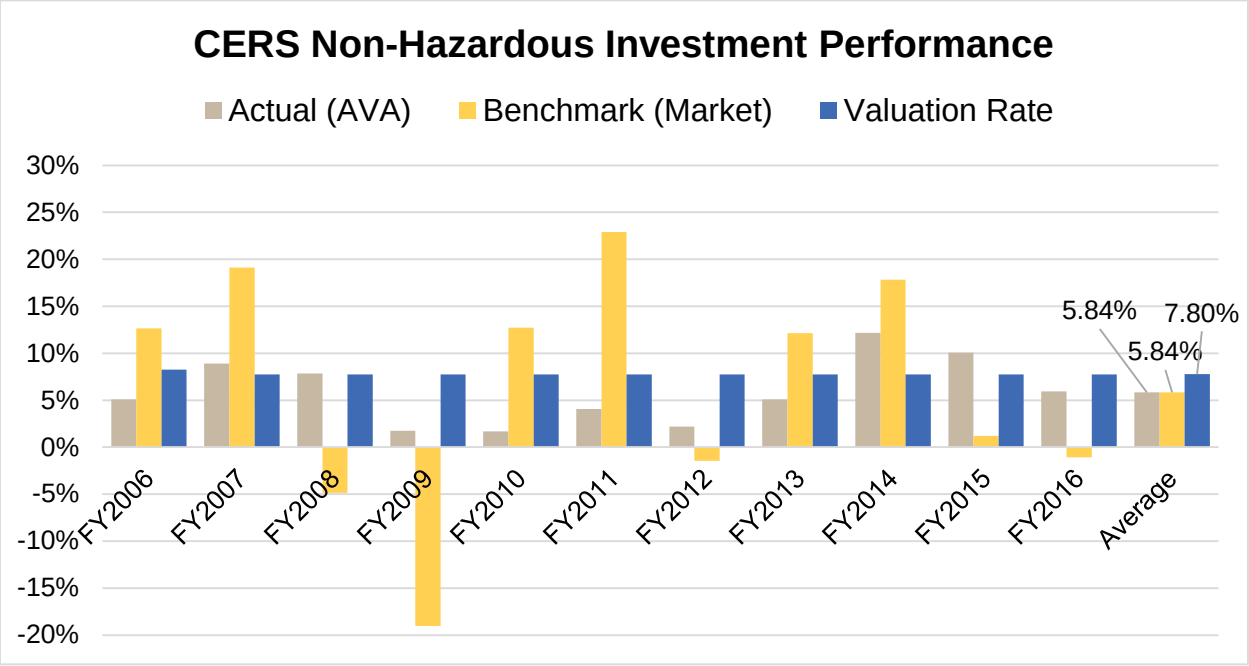


Table 38 summarizes the sources of the increase in the unfunded liability over the 11 years for the CERS Non-Hazardous Retirement System.

Table 38

Major Category	CERS-NH - Causes of Growth in Unfunded Liability	Amount
Funding	1. Appropriation was less (more) than the Actuarially Recommended Contribution (ARC)	($220)
Actuarial	2. Actuarial Back-loading	1,269
Investment	3. Investment performance was less than market performance	207
Investment	4. Market performance was less than the valuation interest rate	931
COLA	5. COLAs granted without any additional funding	672
Actuarial	6. Actuarial assumption changes	984
Actuarial	7. Plan experience different from assumptions	372
	Total	**$4,215**

CERS Hazardous Retirement Plan

Table 39 compares the funded status of the CERS Hazardous as of June 30, 2005 with the funded status as of June 30, 2016. The plan assets increased by $687 million, and the plan liabilities increased by $1,909 million, resulting in an increase in the unfunded actuarial accrued liability of $1,222 million and a decline in the funded status from 81% to 58%.

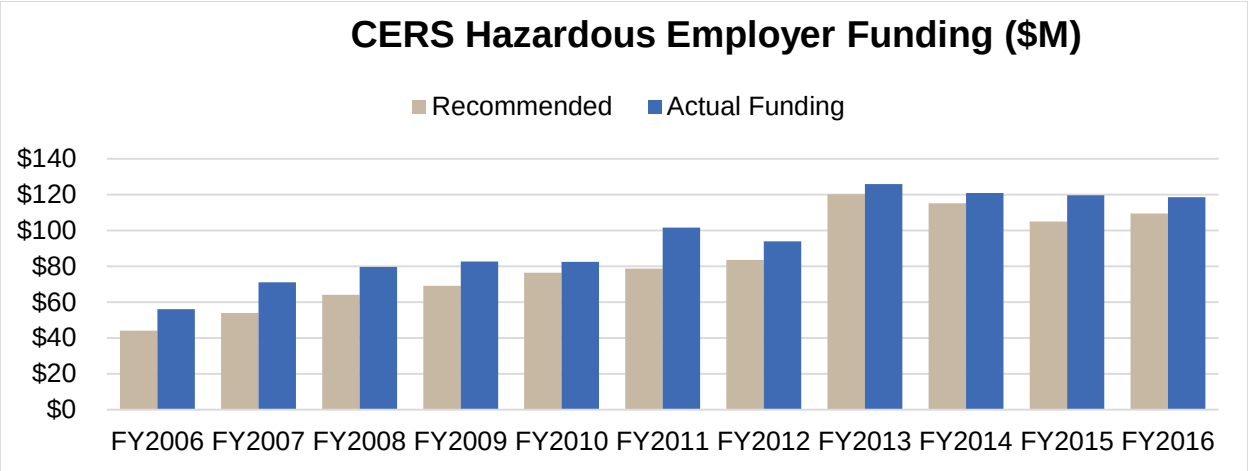
Table 39

CERS-H Pension Benefits Amounts in $Millions			
	6/30/2005	6/30/2016	Change
Valuation Discount Rate	8.25%	7.50%	-0.75%
Actuarial Value of Assets	$1,452	$2,139	$687
Actuarial Accrued Liability	$1,796	$3,705	$1,909
Unfunded Actuarial Accrued Liability	$344	$1,566	$1,222
Funded Status	81%	58%	-23%

Actual and Recommended Employer Contributions

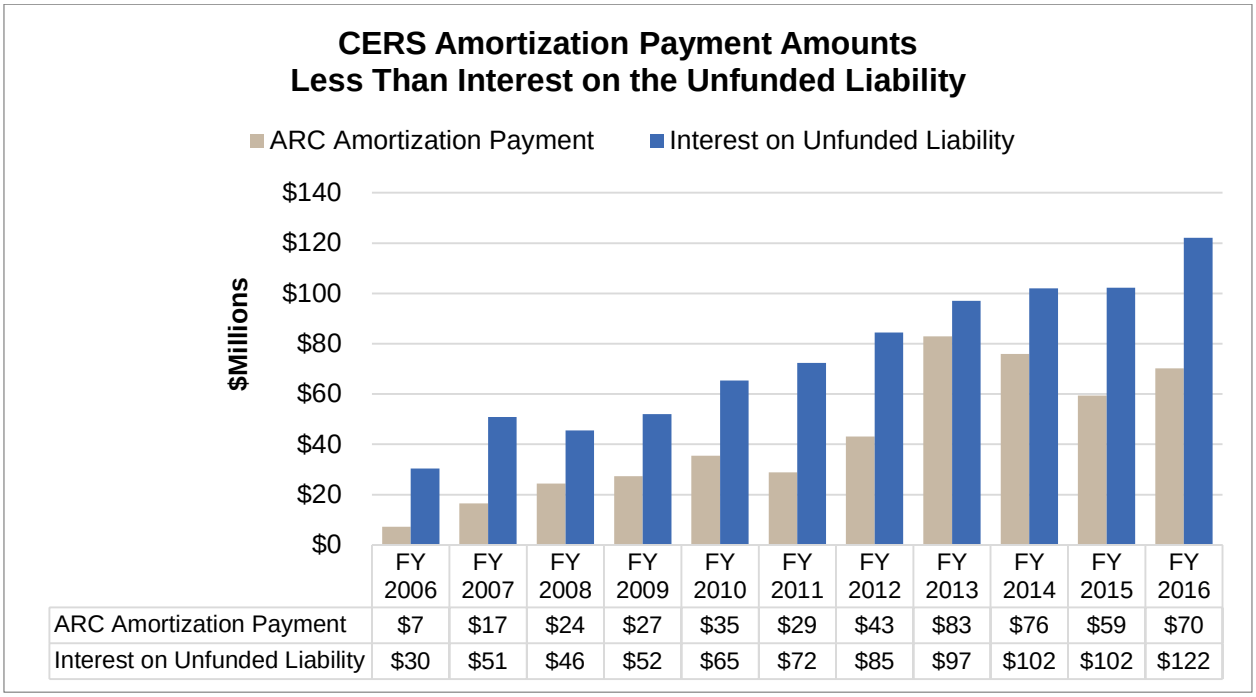
Figure 37 compares the actual employer funding to the recommended contributions. In each of the past 11 years the actual amount exceeded the recommended contributions. Over the 11-year period the aggregate amount of employer funding exceeded the recommended amount by $133 million.

Figure 37



In each of the 11 years, the interest on the unfunded liability exceeded the ARC amortization payment. Over the 11-year period the aggregate amount was $353 million.

Figure 38



	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
ARC Amortization Payment	$7	$17	$24	$27	$35	$29	$43	$83	$76	$59	$70
Interest on Unfunded Liability	$30	$51	$46	$52	$65	$72	$85	$97	$102	$102	$122

Investment Performance

The investment performance was analyzed by comparing actual performance to a benchmark of market performance as well as to the plan's valuation interest rate. Figure 39 shows the investment performance over the past 11 years. The investment performance compound annual rate of earnings over the 11-year period, as measured using the plan's Actuarial Value of Assets was 5.71%, just below the benchmark investment return rate of 5.84%. The valuation interest rate was 8.25% for FY2006 and 7.75% for FY2007 and later years, for an average of 7.80%. For purposes of measuring the change in unfunded liability, the benchmark returns were applied to the Actuarial Value of Assets on a year-by-year basis. As the value of the assets increased over the period, and the benchmark returns exceeded the actual returns from FY2010-FY2016, this resulted in an $82 million investment underperformance relative to market. As noted in Table 40 on the following page, the benchmark returns did not meet the valuation rate, and this resulted in a further $297 million increase in unfunded liability. Overall, the investment performance resulted in a $379 million increase in the unfunded liability.

Figure 39

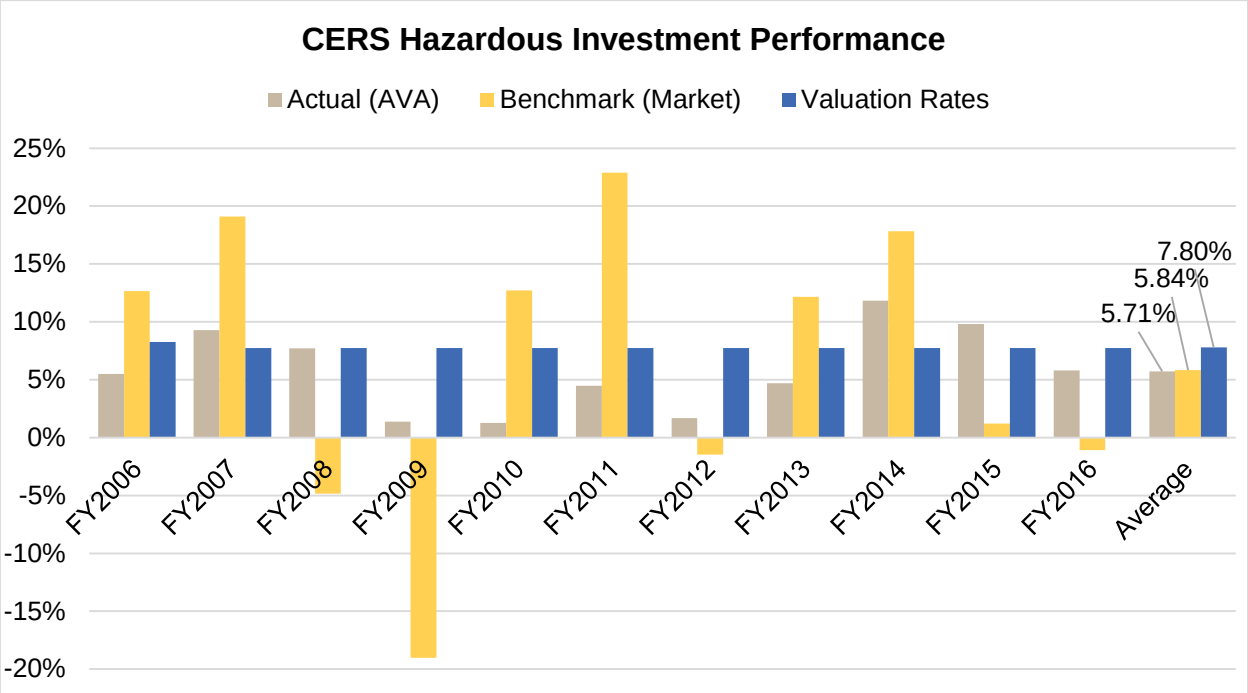


Table 40 summarizes the sources of the increase in the unfunded liability over the 11 years for the CERS Hazardous Retirement System.

Table 40

Major Category	CERS-H - Causes of Growth in Unfunded Liability	Amount
Funding	1. Appropriation was less (more) than the Actuarially Recommended Contribution (ARC)	($133)
Actuarial	2. Actuarial Back-loading	353
Investment	3. Investment performance was less (more) than market performance	82
Investment	4. Market performance was less than the valuation interest rate	297
COLA	5. COLAs granted without any additional funding	267
Actuarial	6. Actuarial assumption changes	249

Major Category	CERS-H - Causes of Growth in Unfunded Liability	Amount
Actuarial	7. Plan experience different from assumptions	107
	Total	**$1,222**

State Police Retirement Plan

Table 41 compares the funded status of the State Police Retirement System as of June 30, 2005 with the funded status as of June 30, 2016. The plan assets decreased by $119 million, and the plan liabilities increased by $316 million, resulting in an increase in the unfunded actuarial accrued liability of $435 million and a decline in the funded status from 77% to 30%.

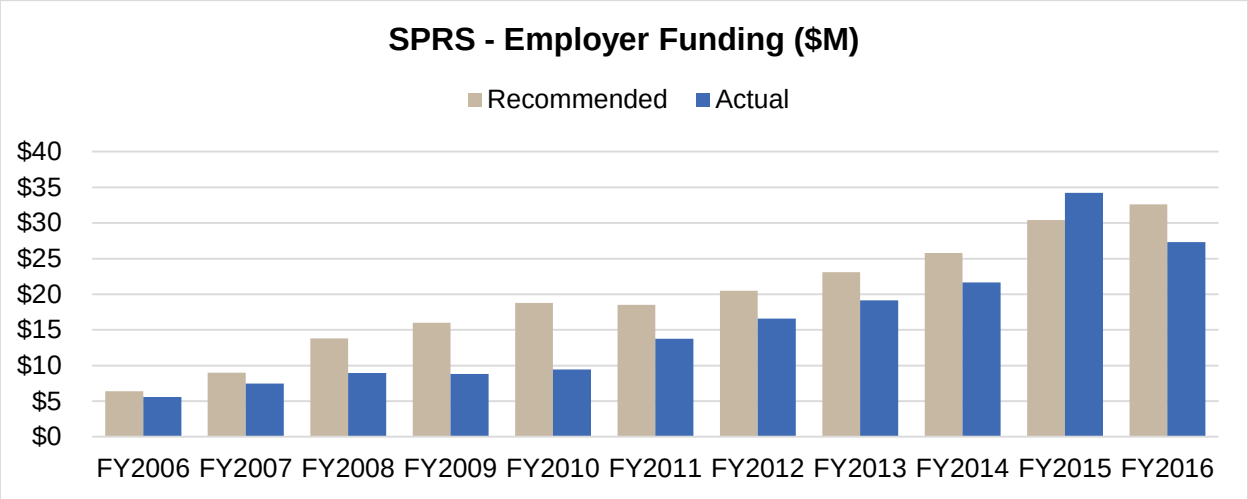
Table 41

SPRS Pension Benefits (Amounts in $Millions)			
	6/30/2005	6/30/2016	Change
Valuation Discount Rate	8.25%	6.75%	-1.50%
Actuarial Value of Assets	$354	$235	($119)
Actuarial Accrued Liability	$459	$775	$316
Unfunded Actuarial Accrued Liability	$105	$540	$435
Funded Status	77%	30%	-47%

Actual and Recommended Employer Contributions

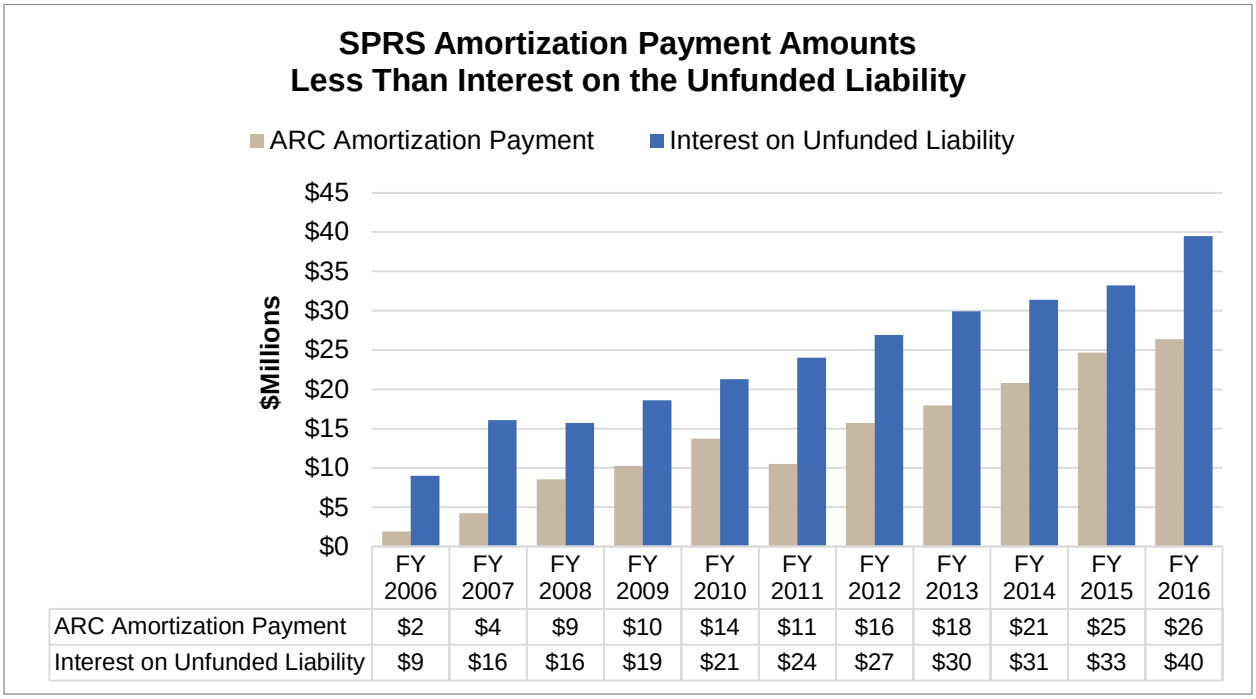
Figure 40 compares the actual employer funding to the recommended contributions. In 10 of the past 11 years the actual amount funded was less than the amount recommended by the KERS Board. In aggregate the funding shortfall was $42 million.

Figure 40



In each of the 11 years, the interest on the unfunded liability exceeded the ARC amortization payment. Over the 11-year period the aggregate amount was $111 million.

Figure 41



	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
ARC Amortization Payment	$2	$4	$9	$10	$14	$11	$16	$18	$21	$25	$26
Interest on Unfunded Liability	$9	$16	$16	$19	$21	$24	$27	$30	$31	$33	$40

Investment Performance

The investment performance was analyzed by comparing actual performance to a benchmark of market performance as well as to the plan's valuation interest rate. Figure 42 shows the investment performance over the past 11 years. The investment performance compound annual rate of earnings over the 11-year period, as measured using the plan's Actuarial Value of Assets was 6.14%, just above the benchmark investment return rate of 5.84%. The valuation interest rate was 8.25% for FY2006 and 7.75% for FY2007 and later years, for an average of 7.80%. For purposes of measuring the change in unfunded liability, the benchmark returns were applied to the Actuarial Value of Assets on a year-by-year basis. As the value of the assets decreased over the period, and the benchmark returns exceeded the actual returns from FY2010-FY2016, this resulted in an $8 million investment underperformance relative to market. As noted in Figure 42, the benchmark returns did not meet the valuation rate, and this resulted in a further $45 million increase in unfunded liability. Overall, the investment performance resulted in a $53 million increase in the unfunded liability.

Figure 42

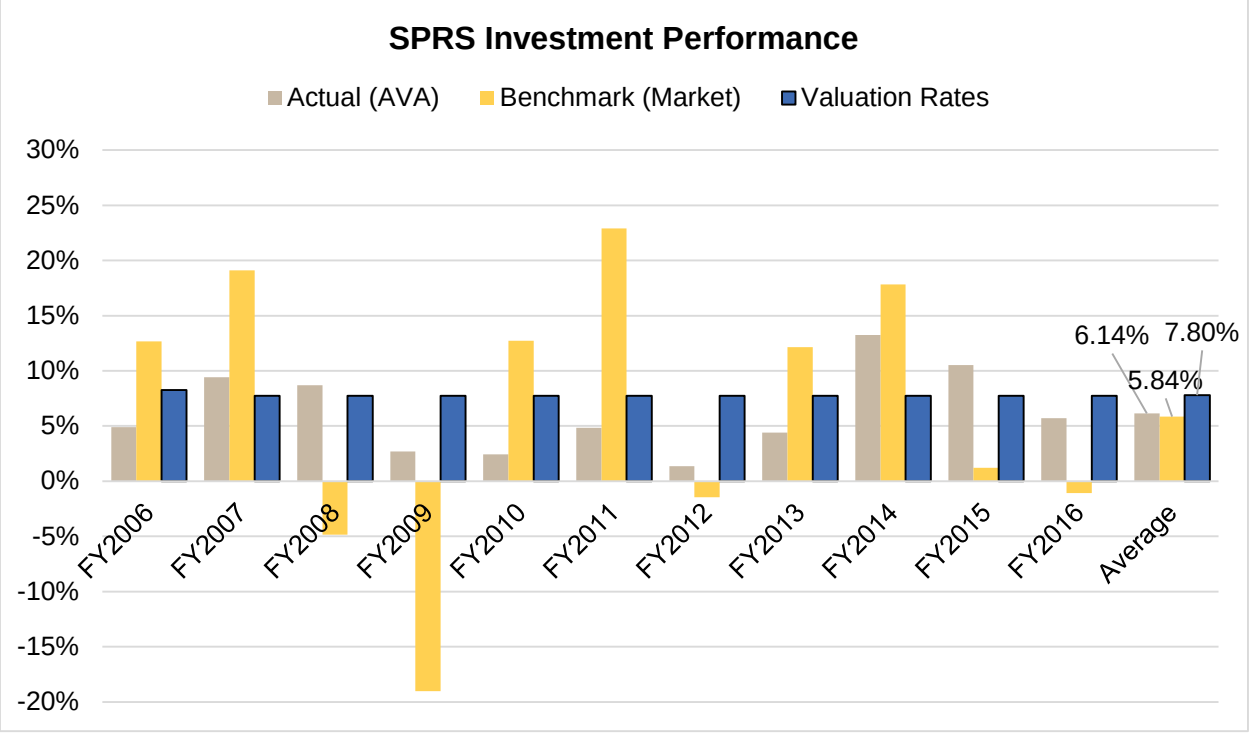


Table 42 summarizes the sources of the increase in the unfunded liability over the 11 years for the State Police Retirement System.

Table 42

Major Category	SPRS - Causes of Growth in Unfunded Liability	Amount
Funding	1. Appropriation was less (more) than the Actuarially Recommended Contribution (ARC)	$42
Actuarial	2. Actuarial Back-loading	111
Investment	3. Investment performance was less (more) than market performance	8
Investment	4. Market performance was less than the valuation interest rate	45
COLA	5. COLAs granted without any additional funding	72
Actuarial	6. Actuarial assumption changes	50
Actuarial	7. Plan experience different from assumptions	107
	Total	**$435**

Kentucky Judicial Retirement Plan

Table 43 compares the funded status of the combined pension and health insurance benefits for the Kentucky Judicial Retirement Plan as of June 30, 2005 with the funded status as of June 30, 2015.[22] The plan assets increased by $38 million, and the plan liabilities increased by $171 million, resulting in an increase in the unfunded actuarial accrued liability of $133 million and a decline in the funded status from 107% to 72%.

Table 43

Kentucky Judicial Retirement Plan - Pension and Insurance Benefits Amounts in $Millions			
	6/30/2005	6/30/2015	Change
Valuation Discount Rate	7.50%	7.00%	-0.50%
Actuarial Value of Assets	$259	$297	$38

22 The Judicial and Legislative plans have full actuarial valuations conducted every other year, and therefore June 30, 2016 data is not available.

Kentucky Judicial Retirement Plan - Pension and Insurance Benefits Amounts in $Millions			
	6/30/2005	6/30/2015	Change
Actuarial Accrued Liability	$241	$412	$171
Unfunded Actuarial Accrued Liability	($18)	$115	$133
Funded Status	107%	72%	-35%

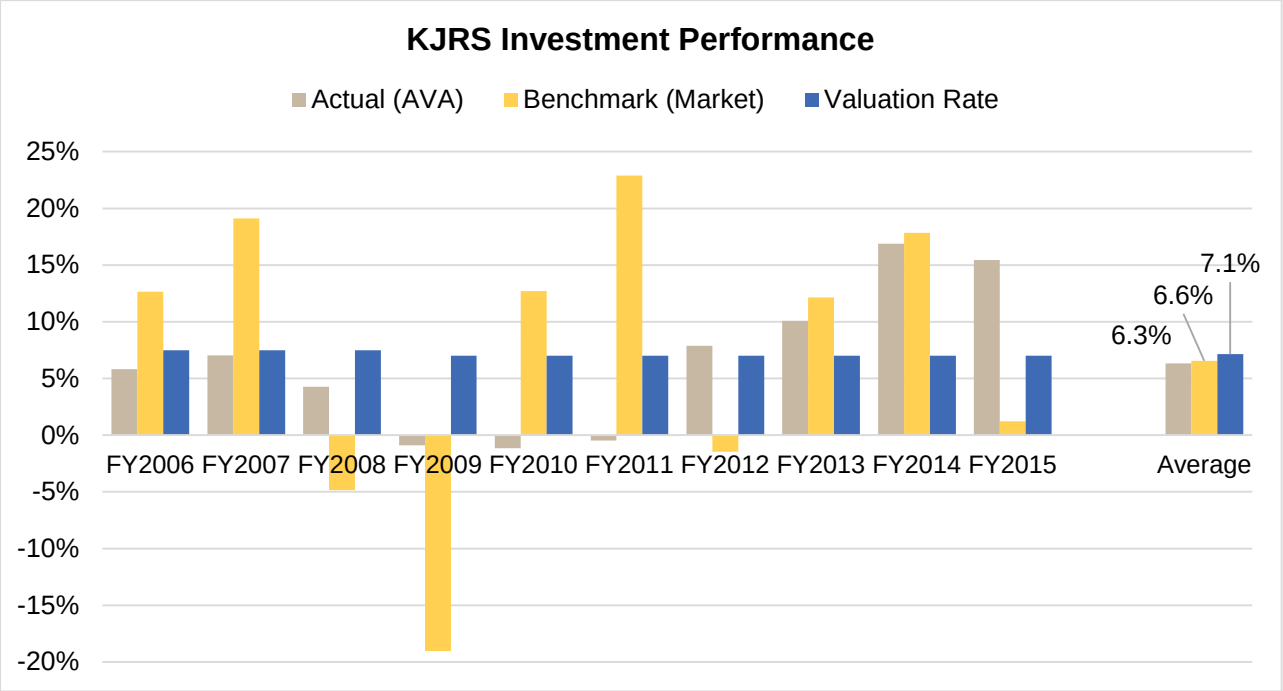
Cost of living benefit increases were granted that increased the liability by $26.6 million, however no allowance was made for these benefits in advance. Consequently, once awarded, the COLAs increased the unfunded liability.

As noted above, the discount rate was reduced from 7.50% to 7.00%, which resulted in an increase in the plan's liability. The net impact of assumption changes was an increase in unfunded liability of $24.7 million.

Contributions to the KJRS plus funds transferred from KERS exceeded the Annual Required Contributions in aggregate over the 10 years, however the aggregate funding was not sufficient to cover the value of the new benefits earned plus the growth in the Unfunded Liability.

The plan's investment performance as measured by the Actuarial Value of Assets was slightly below the benchmark performance during the 10-year period at 6.3% per year compared to the benchmark return of 6.6% per year. The valuation interest rate was 7.5% at the beginning of the period and 7.0% at the end, with a weighted average of 7.1%. The investment underperformance relative to benchmark increased the unfunded liability by $5.1 million. The benchmark investment performance was below the valuation interest rate resulting in additional increase in the unfunded liability of $14.3 million.

Figure 43



The largest factor contributing to the increase in the unfunded liability was plan experience worse than expected. A major contributing factor to this component is the application of final salary from a subsequent State employment being applied to the Judiciary service.

Table 44

Major Category	KJRP - Causes of Growth in Unfunded Liability	Amount
Funding	1. Appropriation was less (more) than the Actuarially Recommended Contribution (ARC)	($11.2)
Actuarial	2. Actuarial Back-loading	30.6
Investment	3. Investment performance was less (more) than market performance	14.3
Investment	4. Market performance was less than the valuation interest rate	5.1
COLA	5. COLAs granted without any additional funding	26.6
Actuarial	6. Actuarial assumption changes	24.7

Major Category	KJRP - Causes of Growth in Unfunded Liability	Amount
Actuarial	7. Plan experience different from assumptions	43.0
	Total	**$133.1**

Kentucky Legislative Retirement Plan

Table 45 compares the funded status of the combined pension and health insurance benefits for the Kentucky Legislative Retirement Plan as of June 30, 2007 with the funded status as of June 30, 2015. The plan assets increased by $23 million, and the plan liabilities increased by $40 million, resulting in an increase in the unfunded actuarial accrued liability of $17 million and a decline in the funded status from 108% to 89%.

Table 45

Kentucky Legislative Retirement Plan - Pension and Insurance Benefits Amounts in $Millions			
	6/30/2005	6/30/2015	Change
Valuation Discount Rate	7.50%	7.00%	-0.50%
Actuarial Value of Assets	$70	$92	$23
Actuarial Accrued Liability	$65	$104	$40
Unfunded Actuarial Accrued Liability	$5	($12)	($17)
Funded Status	108%	89%	-19%

Cost of living benefit increases were granted that increased the liability by $2.9 million, however no allowance was made for these benefits in advance. Consequently, once awarded, the COLAs increased the unfunded liability.

As noted above, the discount rate was reduced from 7.50% to 7.00%, which resulted in an increase in the plan's liability. The net impact of assumption changes was an increase in unfunded liability of $4.7 million.

Funding was less than the ARC, contributing to an increase of $2.9 million in the Unfunded Liability.

The plan's investment performance as measured by the Actuarial Value of Assets was higher than the benchmark performance during the 8-year period at 6.4% per year compared to the benchmark return of 4.4% per year. The valuation interest rate was 7.5% at the beginning of the period and 7.0% at the end, with a weighted average of 7.1%. The investment performance relative to benchmark on a dollar basis had no impact on the unfunded liability. However, the benchmark

investment performance was below the valuation interest rate resulting in additional increase in the unfunded liability of $2.5 million.

Figure 44

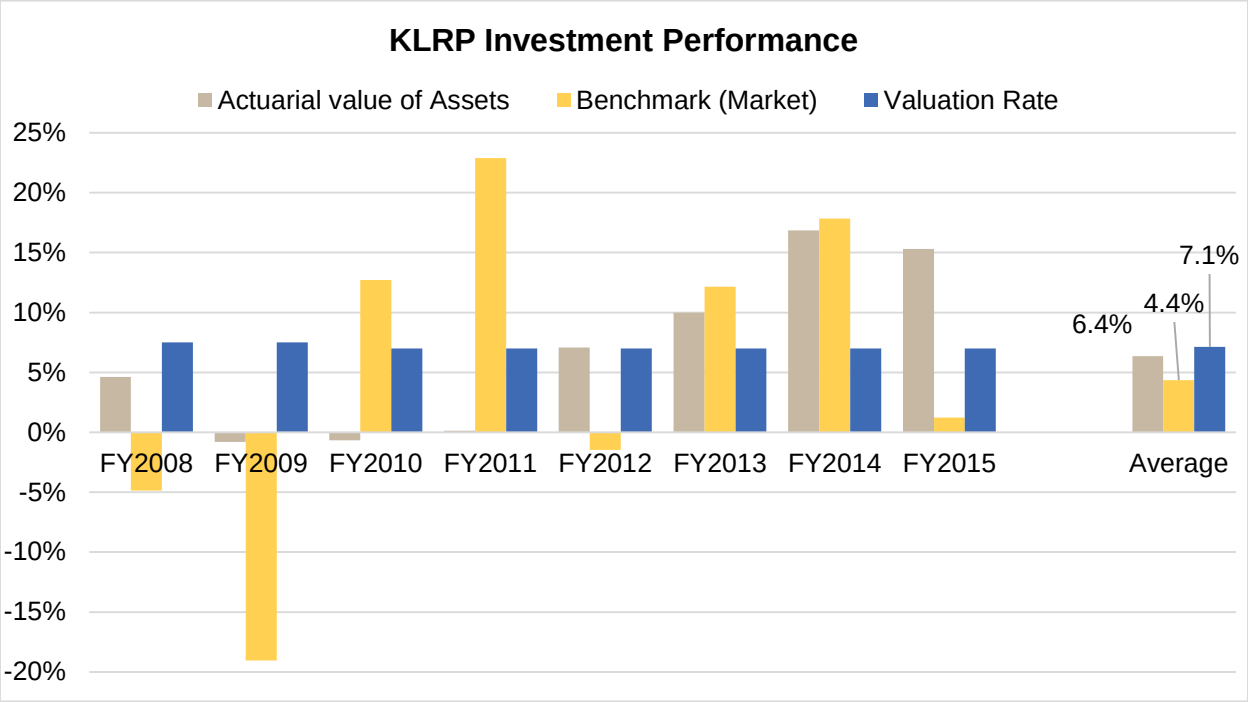


Table 46 shows the largest single factor contributing to the increase in the unfunded liability was the change in actuarial assumptions.

Table 46

Major Category	KLRP - Causes of Growth in Unfunded Liability	Amount
Funding	1. Appropriation was less (more) than the Actuarially Recommended Contribution (ARC)	$2.9
Actuarial	2. Actuarial Back-loading	$2.2
Investment	3. Investment performance was less (more) than market performance	$0.0
Investment	4. Market performance was less than the valuation interest rate	$2.5
COLA	5. COLAs granted without any additional funding	$2.9

Major Category	KLRP - Causes of Growth in Unfunded Liability	Amount
Actuarial	6. Actuarial assumption changes	$4.7
Actuarial	7. Plan experience different from assumptions	$1.9
	Total	**$17.1**

Summary

Table 47 below summarizes the increase in unfunded pension liability by retirement system for the systems and the cause or reason for the increase.

Table 47

	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	% of 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%

	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	% of Total
COLAs	0	1,291	68	672	267	72	27	3	2,400	9%
Total	$9,996	$9,112	$343	$4,215	$1,222	$435	$133	$17	$25,473	100%

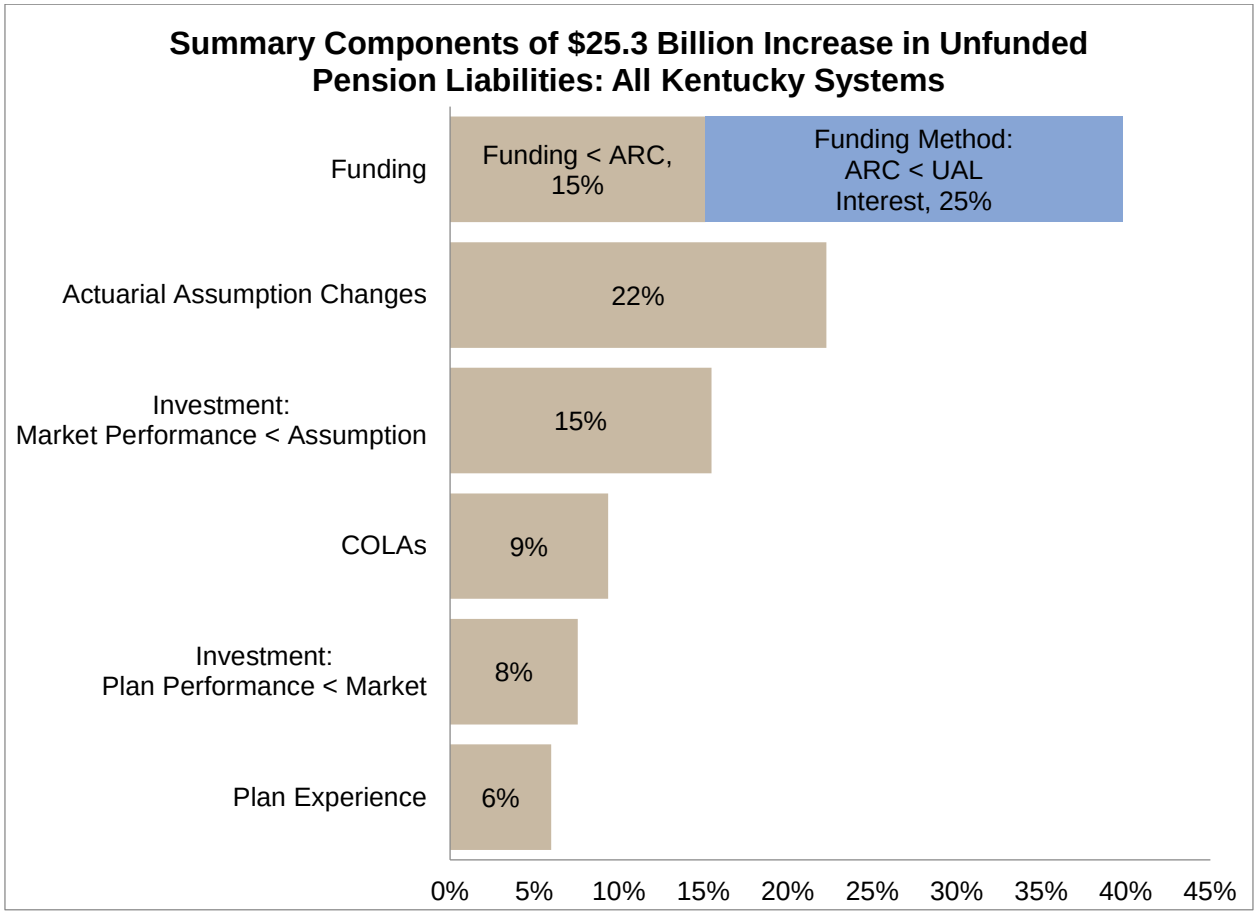
Table 47 also shows that the largest contributing cause to the increase in the unfunded pension liability was the use of the level percentage of payroll funding method, or actuarial back-loading. The magnitude of the increase was affected by the pay increase assumptions – which were far higher than actual 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 the increase in liability due to changes in actuarial assumptions and market investment performance, as measured by the 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. This was an issue for three of the six plans – and was the major cause of the increase for the KERS Non-Hazardous plan.

The fifth major cause was the fact that pension increases (cost-of-living adjustments or COLAs) were granted, but no additional funding was provided.

Figure 45


Summary Components of $25.3 Billion Increase in Unfunded Pension Liabilities: All Kentucky Systems
Funding
Funding < ARC, 15%
Funding Method: ARC < UAL Interest, 25%
Actuarial Assumption Changes
22%
Investment: Market Performance < Assumption
15%
COLAs
9%
Investment: Plan Performance < Market
8%
Plan Experience
6%
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%

VII. Benefit Structure

The benefit structures of the Kentucky retirement systems have been restructured multiple times within the past 15 years:

- 2003, KRS OPEB benefit modified for new hires
- 2004, CERS benefit multiplier conformed to KERS multiplier for new hires
- 2008, TRS pension benefits modified for new hires
- 2008, KRS pension benefits modified for new hires
- 2010, TRS OPEB benefit modified for all members
- 2014, KRS, KJFRS benefits modified for new hires

In addition to reports accompanying most of these initiatives, in recent years the Legislative Research Commission has prepared an annual report to the Public Pension Oversight Board that details the benefits provided under each system.

We gathered information on past and current benefit provisions for the Kentucky Retirement Systems. This detailed information is contained in Appendix A. 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.

In this section of the report we focus on comparisons and findings from reviewing that extensive data that is provided for reference in the appendices. In addition, for a smaller subset of the comparative states, we quantified 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.

The data collected on benefit structures informs the scenarios and analyses being prepared for the third report that will address recommendations and alternatives.

The comparative states and characteristics surveyed are described Table 48.

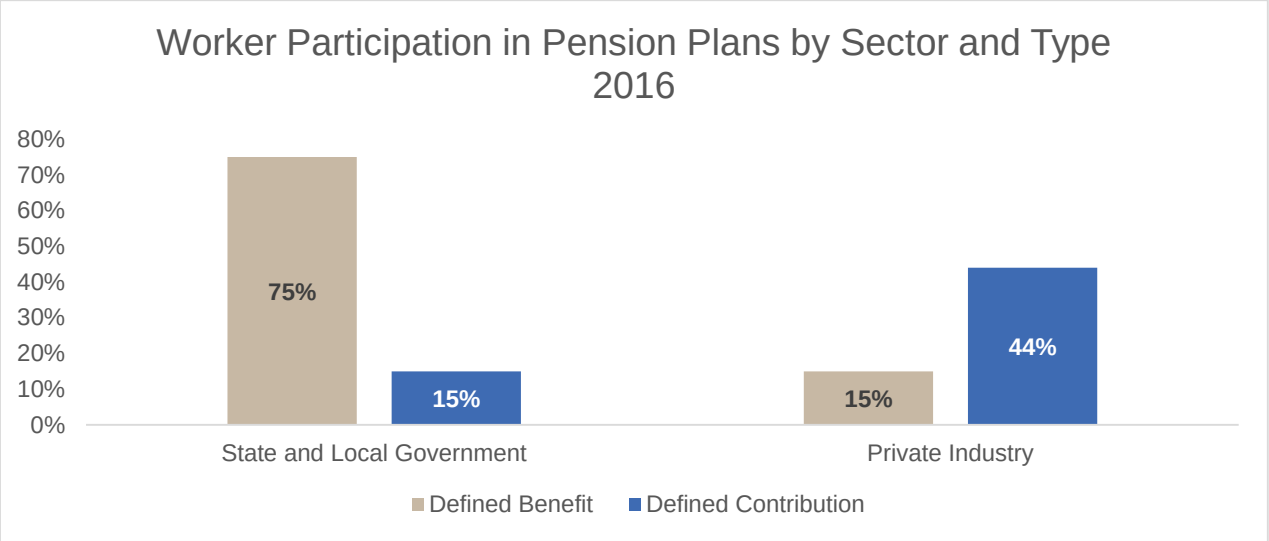
Table 48

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

Industry Trends

Traditional DB pension plans are now uncommon in the private sector, with just 15% of the workforce in private industry participating in such plans, which are often closed to new hires and/or a smaller component of a hybrid benefit. In fact, only 49% of U.S. private industry workers participate in any form of employer-sponsored retirement plan, including DC programs. Among state and local government workers, however, participation in DB plans remains higher at 75%, but below a historical peak of 91% in 1994.

Figure 46



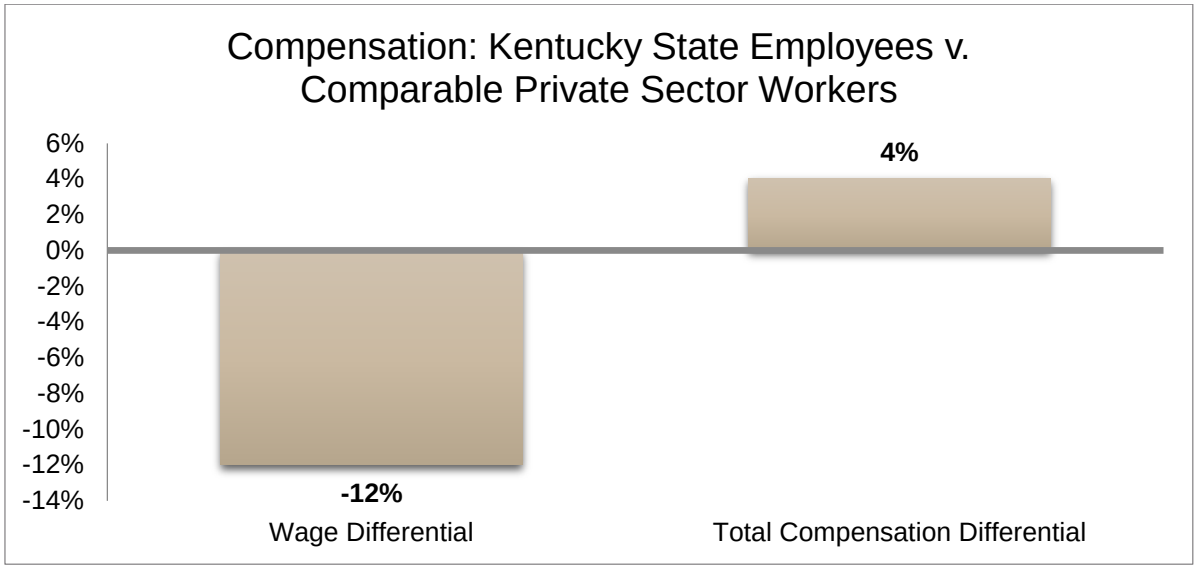
Source: Bureau of Labor Statistics National Compensation Survey, March 2016;

A research study of total compensation for public vs. private sector workers in all 50 states placed Kentucky overall as offering "market level" compensation, which was defined as 18 states that provided compensation within plus or minus 5 percent of the private sector for similar employment.[23] Only one state was evaluated as offering a penalty to private sector compensation, while the majority of states were calculated to provide a premium to private sector compensation for similar employment of 6 or more percent.

The study found that Kentucky state government worker wages were on average 12% lower than for comparable jobs in the private sector. Fringe benefits, however, were 56% of pay for the state employees vs. 38% of pay for Kentucky's private sector. The disparity in the value of benefits provided caused total compensation for state workers to be 4% higher overall.

23 Overpaid or Underpaid? A State-by-State Ranking of Public Employee Compensation, American Enterprise Institute for Public Policy Research, April 2014.

Figure 47

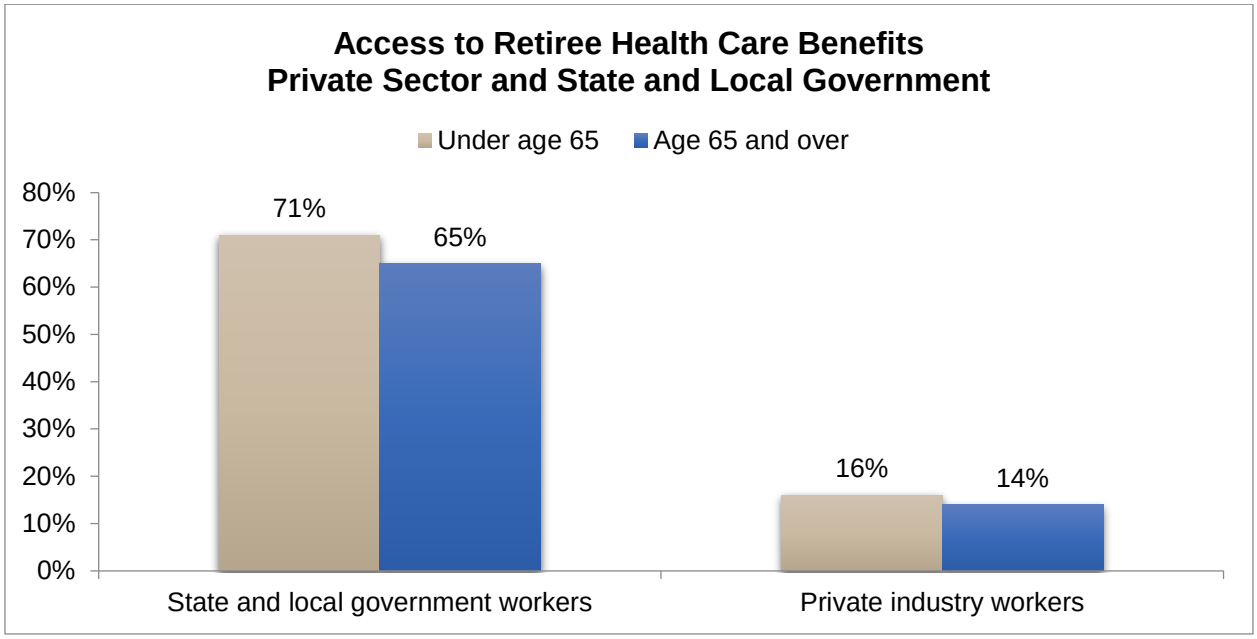


Source: Overpaid or Underpaid? A State-by-State Ranking of Public Employee Compensation, American Enterprise Institute for Public Policy Research, April 2014

For many workers in the general labor market, cash compensation is more impactful for recruitment and retention. At the same time, benefit costs often have higher growth rates and/or volatility. From both fiscal and human resources perspectives, Kentucky might benefit from rebalancing its "total compensation portfolio."

The difference between the benefits offered to pre-2003 KRS workers and TRS members and those offered in the private sector is particularly acute for OPEB. Only a small fraction of private sector workers still had access to post-retirement health care benefits through their employer, when the Bureau of Labor Statistics last surveyed.

Figure 48



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

KRS Pension Plans Compared to Other State Plans

The KRS Tier 1 and Tier 2 benefit plans are traditional defined benefit plans with a benefit factor that is used to multiply against compensation and years of service to determine the pension annuity benefit on retirement.

The Tier 3 plan adopted in 2013 SB2 for new hires after January 1, 2014 is a cash balance plan. The cash balance plan credits the employee's account with their 5% employee contribution, a 4% employer contribution, and in addition guarantees the employee a 4% return on account balances with an additional upside contribution, calculated as 75% of the excess returns above 4 percent for a smoothed five-year period. This benefit structure is unique among the 20 comparative states and therefore does not fit directly in Table 49 on the following page.

In other respects the Tier 2 and Tier 3 benefits are between the low end and median of the benchmark plans.

Across the country, plan designs are complex and interrelated (i.e., some plans may provide optional plans, some have innovative risk management features, lower employee contributions may correlate with lower benefit levels, etc.). Accordingly, the following table of high-level plan characteristics should be viewed as a starting point only for more detailed comparisons.

Among the benchmark plans for civilians, the primary plan structure for new hires remains the traditional defined benefit plan, with 15 such plans, four hybrid (DB+DC) plans, and one DC-only plan. This is not atypical of plan structures nationally. Most state governments still offer defined benefit plans as the primary plan for state employees. According to research by the National Conference of State Legislatures, 19 states offer alternative plans as or among their primary plan(s) for civilian new hires:

- 6 states have mandatory hybrid plans
- 3 states have mandatory cash balance plans, including KRS
- 3 states have mandatory DC plans
- 7 states have a choice of structures instead of a single primary plan
- 8 states have replaced DB plans with alternatives between 2009-2014, and none since

Table 49

	KRS Tier 2 (non-hazardous)	KRS Tier 3 (non-hazardous)	Low – Benchmark Plans	Median – Benchmark Plans	High – Benchmark Plans
Employee Contribution (with Social Security – 16 states)	5%	5%	2.25% (GA 1.25% DB and 1.0% 401(k))	5% (MI, VA)	9.5% (TX)
Employee Contribution (no Social Security – 4 states)	N.A.		4% (IL)	9%	11% (MA)
Vesting Period	5 YRS	5 YRS	4 YRS (MI:401(k)) 5 YRS (CA, CO, NC, OH, TN, WV, WI)	8 YRS (FL, SC)	10 YRS (GA, IL, IN, MA, MO, NY, PA, TX)
Benefit Multiplier (DB Plans only)	≤ 10 YOS:1.10% 11-20 YOS: 1.30% 20-26 YOS: 1.50% 26-30 YOS: 1.75% ≥ 30 YOS: 2.00%	N.A.	1.0%	1.82%	2.5%
Final compensation period	5 YRS	N.A.	1/12 of the Highest 3 YRS (CO)	5 YRS (IN, IA, MA, NY, OH, SC, TN, VA, WV)	8 YRS (FL, IL)
COLA	Ad hoc basis	Ad hoc basis	None / Ad hoc basis	3%	5%

Source: PFM review of state financial reports, valuation reports, employee handbooks, and other documents. Please see Appendix B for full data.

TRS Pension Plan Compared to Other State Teacher Plans

The Teachers' Retirement System plan is a traditional defined benefit plan, and Kentucky is among the 14 states where all or most teachers are not covered by Social Security. The traditional DB plan is even more common among the teachers, with 17 DB plans, three hybrid plans, and no DC-only or cash-balance plans among the 20 comparative states. The Kentucky plan is approximately equal to the median in benefit multiplier at typical amounts of service, lower than the median in employee contributions for the plans that are not in Social Security, and is the most generous in retirement eligibility, as illustrated further in Table 50.

Table 50

	TRS Tier 2 (non-university members)	Low – Benchmark Plans	Median – Benchmark Plans	High – Benchmark Plans
Employee Contribution (with Social Security – 13 states)	N.A.	3% (FL, IN)	6%	8.66% (SC)
Employee Contribution (no Social Security – 7 states)	9.105%	7.7% (TX)	10%	14.5% (OH)
Vesting Period	5 YRS	5YRS	5 YRS	10 YRS
Benefit Multiplier (DB Plans only)	< 10 YOS: 1.70% 10-20 YOS: 2.00% 20-26 YOS: 2.30% 26-30 YOS: 2.50% 30 YOS: 3.00%	1.1%	2.0%	2.5%
Final compensation period	5 YRS	1/12 of the Highest 3 YRS	5 YRS	8YRS
COLA	1.5% annually, additional ad hoc increases must be authorized by the General Assembly	None (WV, FL) or Ad hoc basis	3%	5%

Source: PFM review of state financial reports, valuation reports, employee handbooks, and other documents. Please see Appendix B for full data.

Among the 20 comparative states, only three other states fund the employer contribution for teacher pensions completely at the state level, as in Kentucky. Nine states fund the employer contribution completely at the local school district level, with the rest sharing in the allocation.

KRS OPEB Plans Compared to Other State Plans

The KRS retiree medical plans were reformed for employees hired after July 1, 2003, from plans that provide similar coverage to active employees with up to 100% of the cost paid by the Commonwealth, to a fixed or defined contribution model. Employees hired since July 1, 2003 receive a set contribution per month of service to an account to be used by the retiree to purchase coverage. Among the 20 comparative states, 12 continue to offer new hires a traditional defined benefit medical plan for retirees, with some significant portion of the premium paid by the employer, if typical years of service provisions are met.

Table 51

	KRS Tier 1 (non-hazardous)	KRS Tier 3 (non-hazardous)	Low – Benchmark Plans	Median – Benchmark Plans	High – Benchmark Plans
Benefit Structure	Defined Benefit with premium-sharing based on years of service	Fixed/ defined contribution	• 2 states offer no coverage to new hires • 3 states offer access only with no premium sharing • 3 states offer fixed contributions	Premium-sharing based on fixed percentage, years of service, or fixed subsidies	5 states offer 100% employer-paid coverage based on years of service
Employer-Provided Benefit	Premium costs for state plan on following schedule: 0 – 3 years 0% 4 – 9 years 25% 10 – 14 years 50% 15 – 19 years 75% 20 or more years 100%	$12.99 per month per year of service, adjusted by 1.5% annually	None	Varies (see Appendix B)	100%
Active Employee Contribution	1%	1%	None	Most states do not have an active employee contribution	1%

Source: PFM review of state financial reports, valuation reports, employee handbooks, and other documents. Please see Appendix B for full data.

TRS OPEB Plans Compared to Other State Teacher Plans

The retiree medical plans for teachers in the comparative states do not vary significantly from the civilian employee plans, as both types of employees are in the same system with the same benefits in many of the 20 states. Teachers in Kentucky, both current actives and new hires, continue to receive a traditional defined benefit medical coverage. Reforms adopted in 2010 increased active employee contributions toward to the benefit and introduced local School District funding of contributions towards the OPEB benefit and liability. Employees can continue to earn an employer contribution of up to 100% of premium costs, based on years of service. While civilian state employees in California and Illinois can receive up to 100% of premiums paid by the employer, based on years of service, teachers in those states either pay 100% of the premium in the case of California, or a percentage of premium based on the medical plan.

Table 52

	TRS	Low – Benchmark Plans	Median – Benchmark Plans	High – Benchmark Plans
Benefit Structure	Defined Benefit with premium-sharing based on years of service	• 2 states offer no coverage to new hires • 4 states offer access only with no premium sharing • 3 states offer fixed contributions	Premium-sharing based on fixed percentage, years of service, or fixed subsidies	3 states offer 100% employer-paid coverage based on years of service
Employer-Provided Benefit	Premium costs for state plan on following schedule: 0-14.99 YOS: 0% 15-19.99 YOS: 45% 20-24.99 YOS: 65% 25-25.99 YOS: 90% 26-26.99 YOS: 95% 27+ YOS: 100%	None	Varies (see Appendix B)	100%

	TRS	Low – Benchmark Plans	Median – Benchmark Plans	High – Benchmark Plans
Active Employee Contribution	Non-University members: 3.75% University members: 2.77%	None	Most states do not have an active employee contribution	Three other states have an employee contribution of between 1% and 1.45% of pay

Source: PFM review of state financial reports, valuation reports, employee handbooks, and other documents. Please see Appendix B for full data.

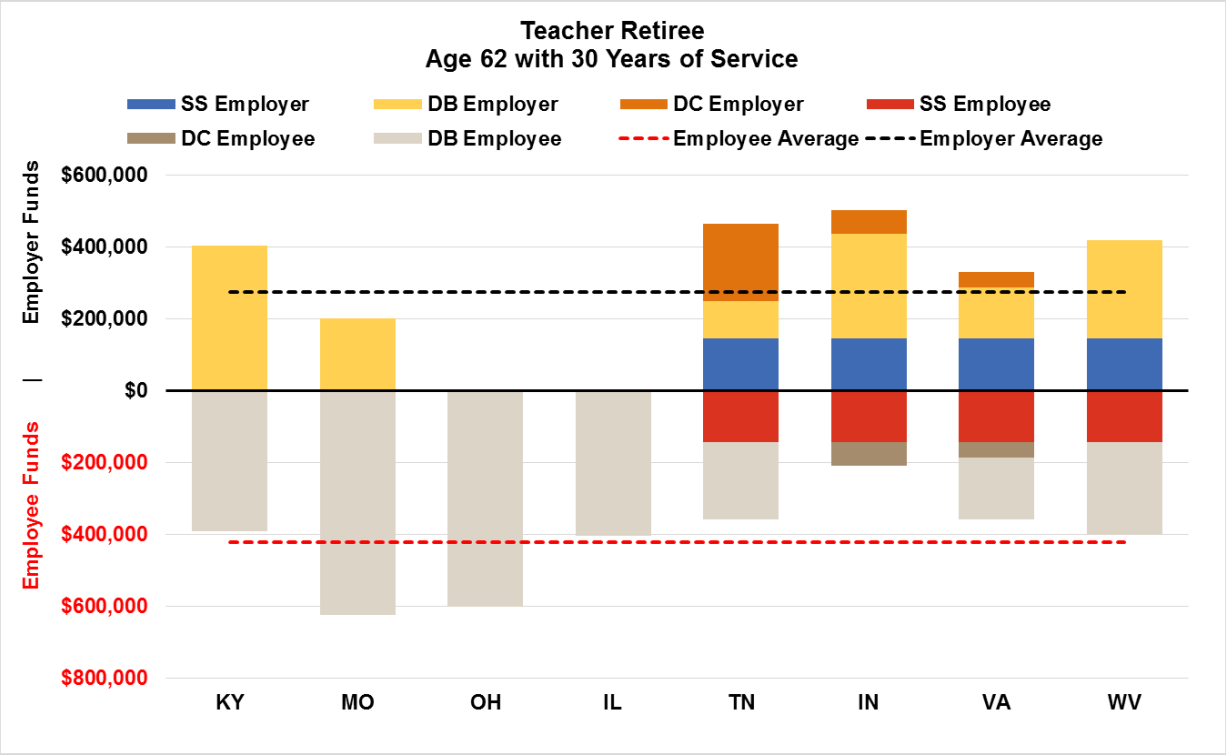
Quantitative Value of Benefits Comparison

To further evaluate TRS retirement saving arrangements for employees, it is useful to compare with plans provided by contiguous states. In Figure 49 below we show the lump sum value of the retirement benefit from Social Security and from defined benefit and defined contribution plans maintained by those states. Note that all the states depicted provide a defined benefit plan for teachers. Three of the states (Tennessee, Indiana and Virginia) also provide a supplemental defined contribution plan. We show those combined results in the graph below.

The graph below was made using the plan provisions for a new hire (current contribution rates, COLAs, etc.) theoretically retiring this year. The amounts shown above the zero line are the employer provided benefit, separately for Social Security (the dark blue portion of the bar), the defined benefit plans (the yellow portion), and the defined contribution plans (the orange portion). The amounts shown below the line are the additive values created through employee contributions, separately for Social Security (the dark red portion), the defined benefit plans (the light tan portion), and the defined contribution plans (the dark tan portion). As demonstrated in the graph, TRS's employer contributions are higher than average, while the employee contributions fall slightly below the average.

It should be noted that for Ohio and Illinois, someone retiring at age 62 with 30 years of service does not qualify for unreduced benefits. The employee contributions in these cases (14% and 9.4%, respectively) are sufficient to fully fund the reduced benefit payments, and thus the employer contributions are zero.

Figure 49

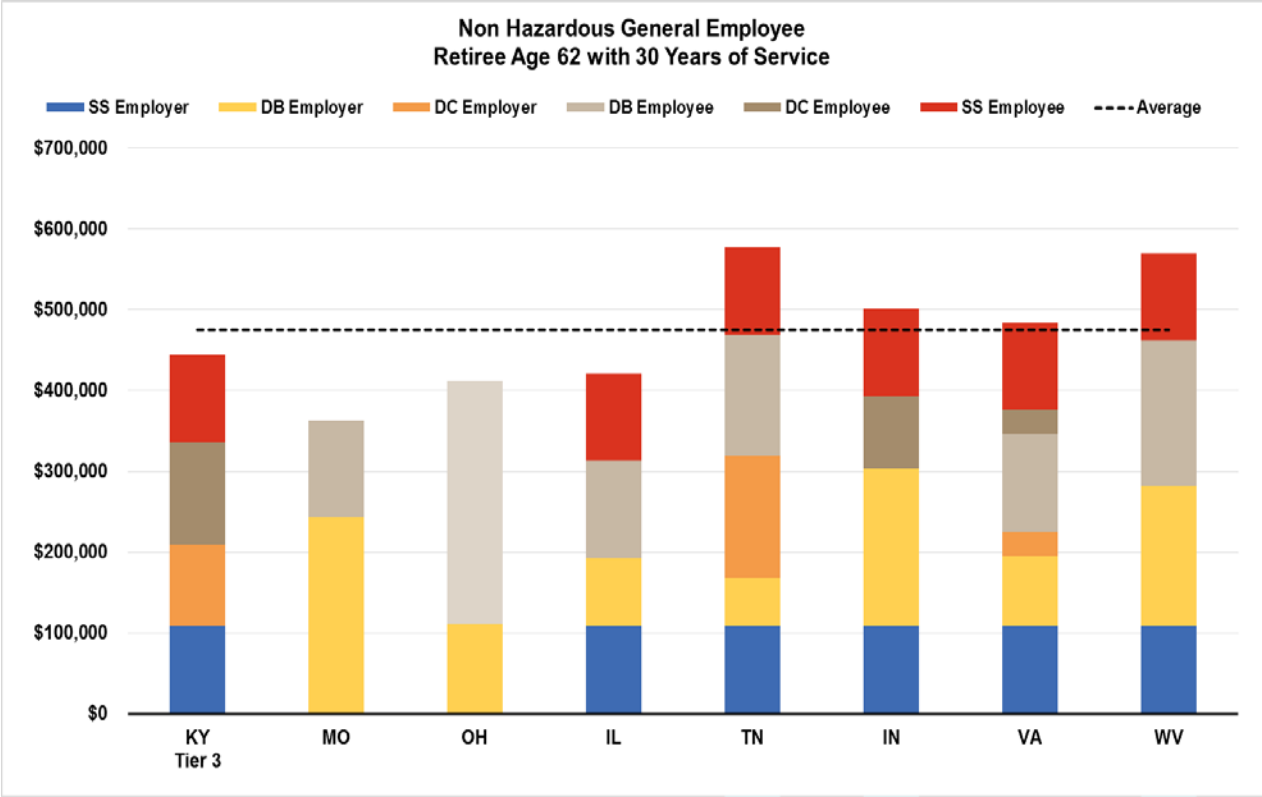


Source: PRM Consulting Group

To assess the adequacy and competitiveness of KERS-NH's retirement savings arrangements for current non-hazardous general employees, we again compared results to the results produced under the retirement systems of contiguous states. We show those results in Figure 50 below.

The graph was made using the plan provisions for a new Tier 3 hire (current contribution rates, COLAs, etc.) theoretically retiring this year. The amounts shown above the zero line are the employer provided benefit, separately for Social Security (the dark blue portion of the bar), the defined benefit plans (the yellow portion), and the defined contribution plans (the orange portion). The amounts shown below the line are the additive values created through employee contributions, separately for Social Security (the dark red portion), the defined benefit plans (the light tan portion), and the defined contribution plans (the dark tan portion). As shown, KERS-NH is fairly close to the average for both employer and employee contributions.

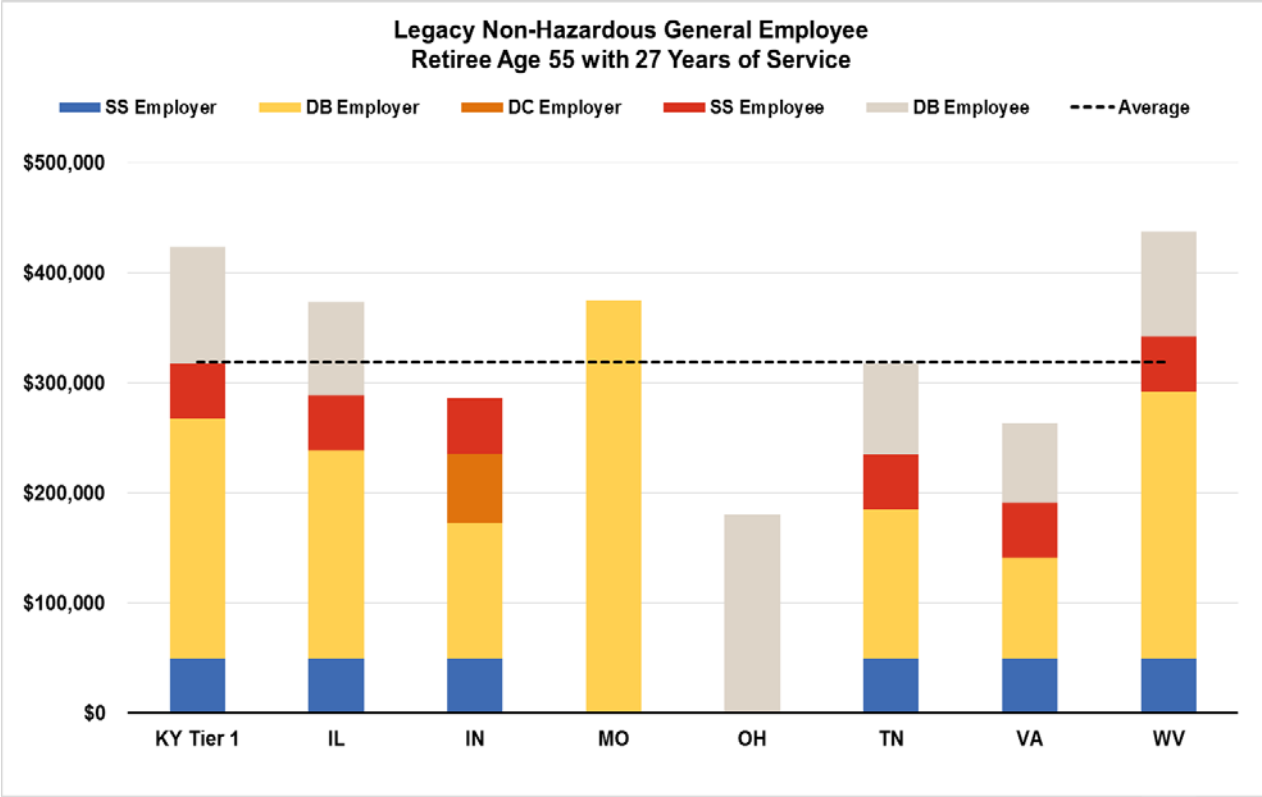
Figure 50



Source: PRM Consulting Group

Similar analysis for the roughly 23,000 active employees in the KERS-NH Tier 1 legacy plan indicates that the provision for employees to retire early with an unreduced benefit after earning 27 years of service, regardless of age, provides the potential of a significantly larger benefit than the average benefit provided by other states. As of June 30, 2016, 1,355 Tier 1 employees under the normal retirement age of 65 had achieved 27 years of service and were therefore eligible for this provision. Of these, 773 were under the age of 55. The lump sum value of the benefit for a Tier 1 KERS-NH employee retiring at age 55 with 27 years of service is over $100,000, or roughly 33%, higher than the average of the other states.

Figure 51

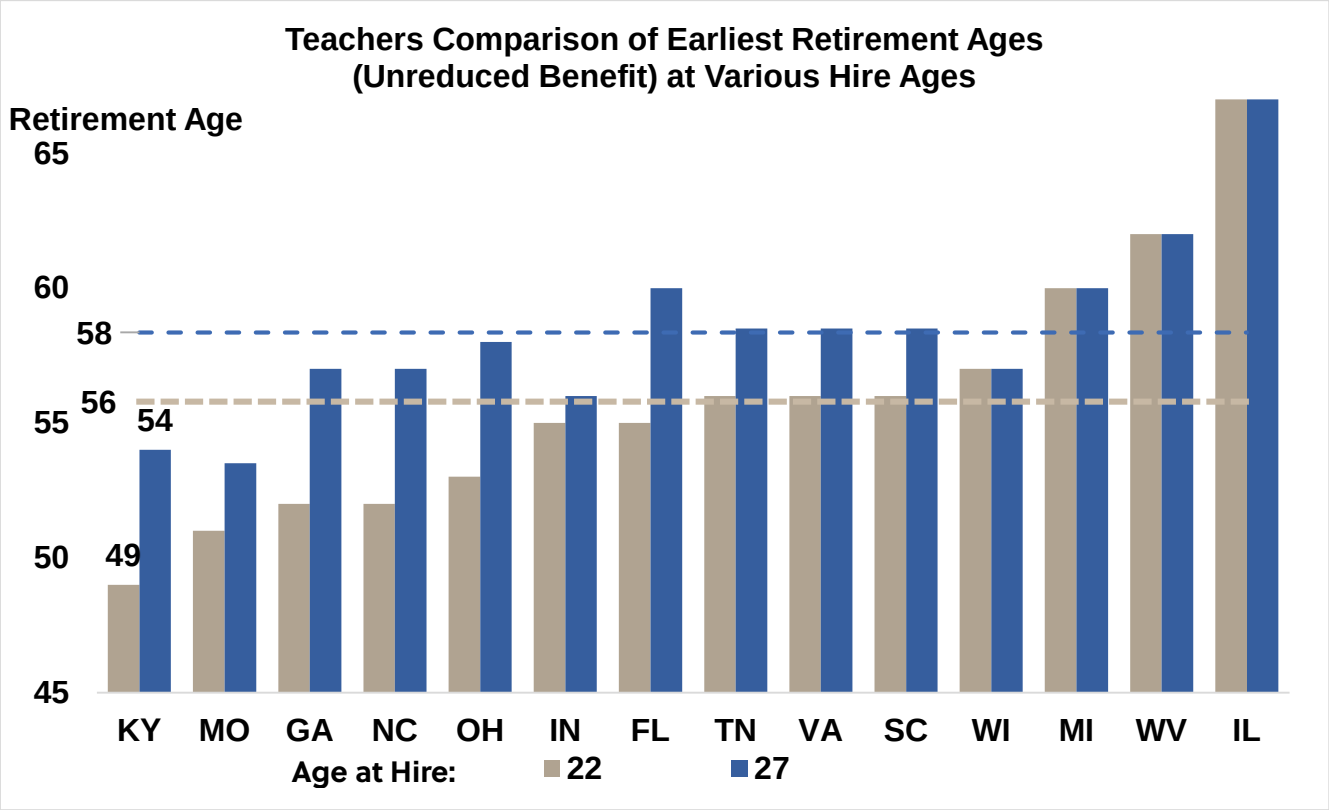


Source: PRM Consulting Group

In addition to TRS contributing more than the average employer, these benefits are available to employees at an earlier age, which boosts the cost of the employer. As a way of comparing retirement eligibilities, we calculated the earliest possible age of retirement for contiguous and competitor states' teachers, and have displayed them in Figure 52 below. The calculations were made using two different assumptions for age at hire: 22 years and 27 years.

For example, if someone is hired at age 32, and the retirement requirement for an unreduced benefit is (1) age 65 with 5 years of service or (2) Rule of 90, the earliest possible retirement age is 61 (age 61 plus 29 years of service meets the rule of 90 requirement). The dotted lines represent the average earliest retirement age for each age at hire. As shown below, TRS is below the average for all hire ages represented. According to actuarial reports, the average age at retirement of a TRS employee is 55, which is not an eligible age for full benefits for seven of the comparative states.

Figure 52



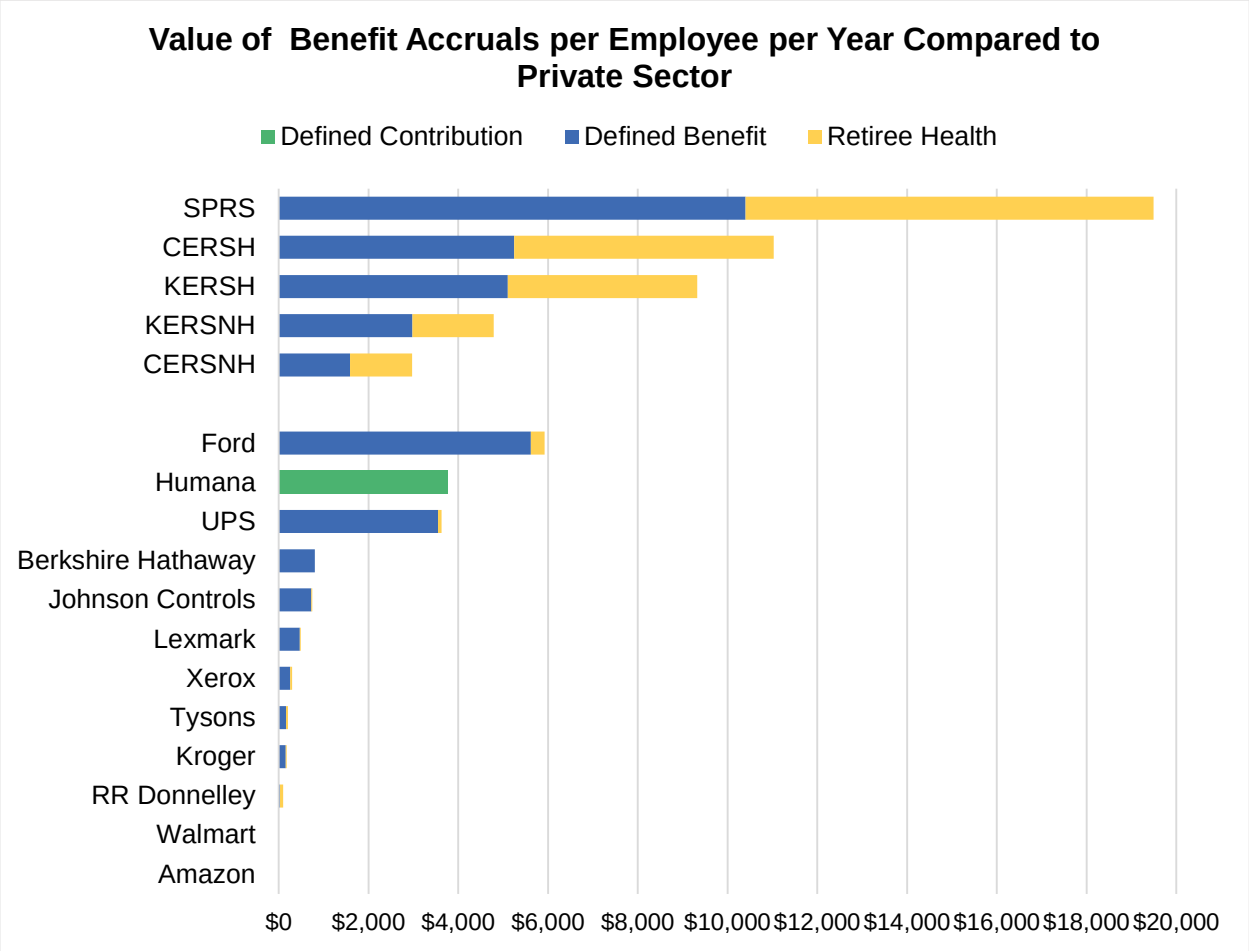
Source: PRM Consulting Group

In addition to comparing to other public systems, following on the comparison to private sector employment cited above, we also compared the value of the retirement benefits (defined contribution, defined benefit, and retiree healthcare) provided to employees by the largest private sector employers in Kentucky with the value of the retirement benefits provided by the Commonwealth to its employees.

Data was collected from the latest corporate annual reports which show the total number of employees and total value of the benefits earned. In accordance with SEC requirements, the value of the benefits reported in the 10-k's are based on "market" discount rates, which averaged 4.40%. The value of the benefits earned under the KRS plans has been adjusted to reflect the equivalent discount rate.

Figure 53 compares the value of benefits earned per year for the five KRS plans with the value from the 12 largest Kentucky employers.

Figure 53



Source: PRM Consulting Group analysis of 10-k reports

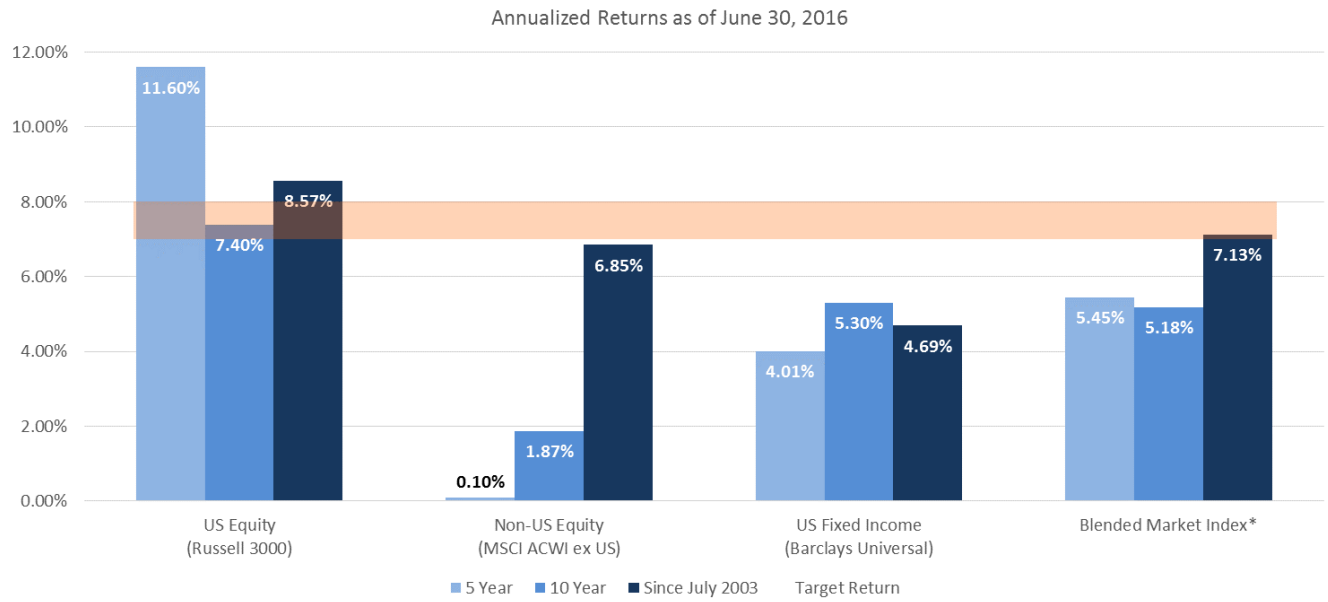
VIII. Investment Analysis

PFM Asset Management LLC has developed a detailed analysis of the investment allocation, performance, and risk profile of each of the Commonwealth's retirement systems. Full detail is provided in Appendix C, building on the analysis of fees, administrative issues, and transparency practices previously issued in Report #1 on Transparency and Governance.

Overview of Market Environment

Although more recent investment returns have been strong for certain asset classes, the past decade has shaped a difficult environment for long-term retirement plans that have target returns of 7-8% on an annualized basis. Looking at traditional asset classes, only US Equity has achieved an annualized return greater than 7% during the past 10 years. As seen in Figure 54 below, a blended market index consisting of 35% Russell 3000, 35% MSCI ACWI ex US (net) and 30% Barclays Universal significantly lagged a 7-8% target return over the past 10 years and has only slightly exceeded 7% since July 2003.

Figure 54

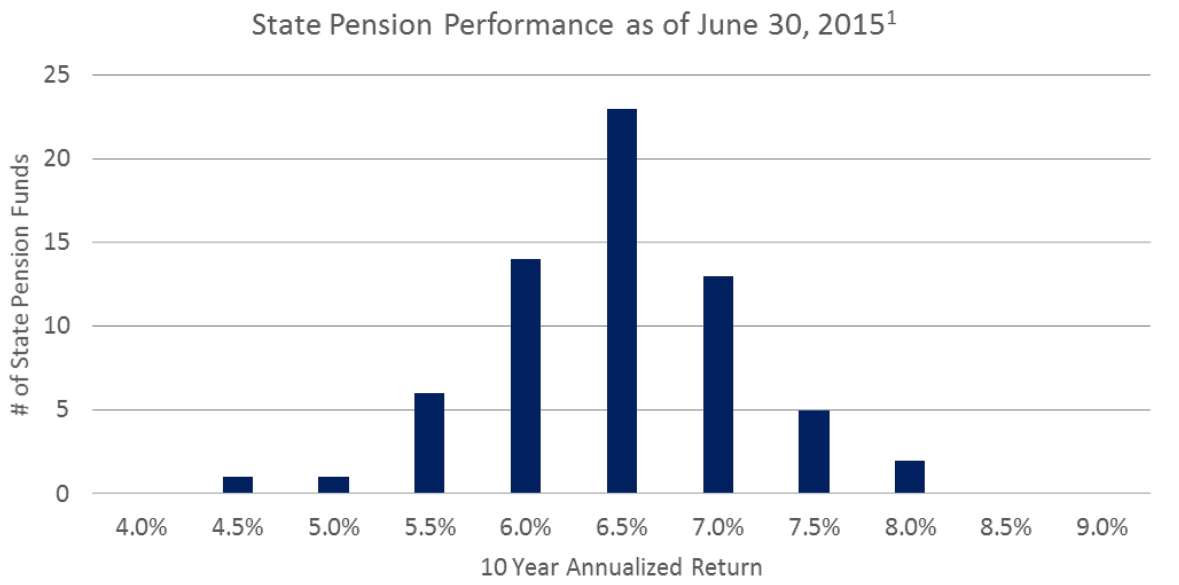


*Note: * Blended Market Index: 35% Russell 3000, 35% MSCI ACWI ex US, 30% Barclays Universal*

Not surprisingly, most state pension plans have struggled to achieve their target return during the last decade. For the 10-year period ending June 30, 2015, the average state pension plan earned

just 6.84% annualized, according to a study by Cliffwater LLC.[24] Returns ranged from 4.75% to 8.35% with a top quartile return of just 7.13%, significantly lagging the median actuarial return assumption of 8%.

Figure 55



Source: Cliffwater LLC, An Examination of State Pension Performance: 2006 to 2015, September 2016.

As outlined further below, the Kentucky retirement plans also failed to achieve their target return over the past decade, contributing to the poor funded status of the plans.

Allocation to Alternative Investments

In addition to relatively poor market performance, the last decade saw a significant increase in the use of alternative investments (hedge funds, private equity, etc.) in state pension plans. According to a study by Pew Charitable Trusts[25], the average allocation to alternative investments more than doubled from 2006 (11%) to 2012 (23%). The increase in this allocation was primarily funded from equities as the average fixed income allocation remained fairly static. Further analysis into the financial reports of various comparable state retirement plans showed that roughly 7.5% of the alternatives allocation consisted of hedge funds (refer to Appendix for more details). Although some alternative asset classes have exhibited strong relative performance, hedge funds in

24 Cliffwater LLC, An Examination of State Pension Performance: 2006 to 2015, September 2016.

25 Pew Charitable Trusts, State Public Pension Investments Shift Over Past 30 Years, June 2014.

particular have consistently lagged a traditional equity and fixed income benchmark, as illustrated in Table 53 (as of June 30, 2016).

Table 53

	1 Year	3 Years	5 Years	10 Years	Since July 2003
Blended Market Index	**-1.08%**	**5.67%**	**5.45%**	**5.18%**	**7.13%**
HFRI Fund of Funds Composite Index	-5.40%	1.92%	1.63%	1.58%	3.09%
CA US Private Equity Index	10.64%	11.61%	11.52%	7.41%	14.29%
NCREIF Property Index	3.20%	11.23%	11.37%	10.76%	9.28%

When looking at the alternatives allocations for the Kentucky Retirement System plans, a roughly 10% allocation to hedge funds in the KRS Retirement Plans had a negative impact on overall plan returns, which lagged the TRS Retirement Plans that did not have an allocation to hedge funds. However, it should be noted that the newly appointed Board for KRS has made significant progress in removing the hedge fund investments, which is likely to result in improved performance and lower fees going forward.

KRS Retirement Plans

Looking first at a summary level of the KRS pension plans, as shown below in Table 54 and detailed in the Appendix, all five plans slightly underperformed the policy benchmark in most trailing periods and significantly lagged the 7.5% investment return assumption for the entire period examined. When comparing the plans to a universe of public plans > $1 billion, KFRS total performance falls in the bottom quartile for all trailing periods shown. Performance at the asset class level has generally been in-line with the relevant index for longer periods, with the exception of real estate, indicating manager selection has not been a significant detractor of performance.

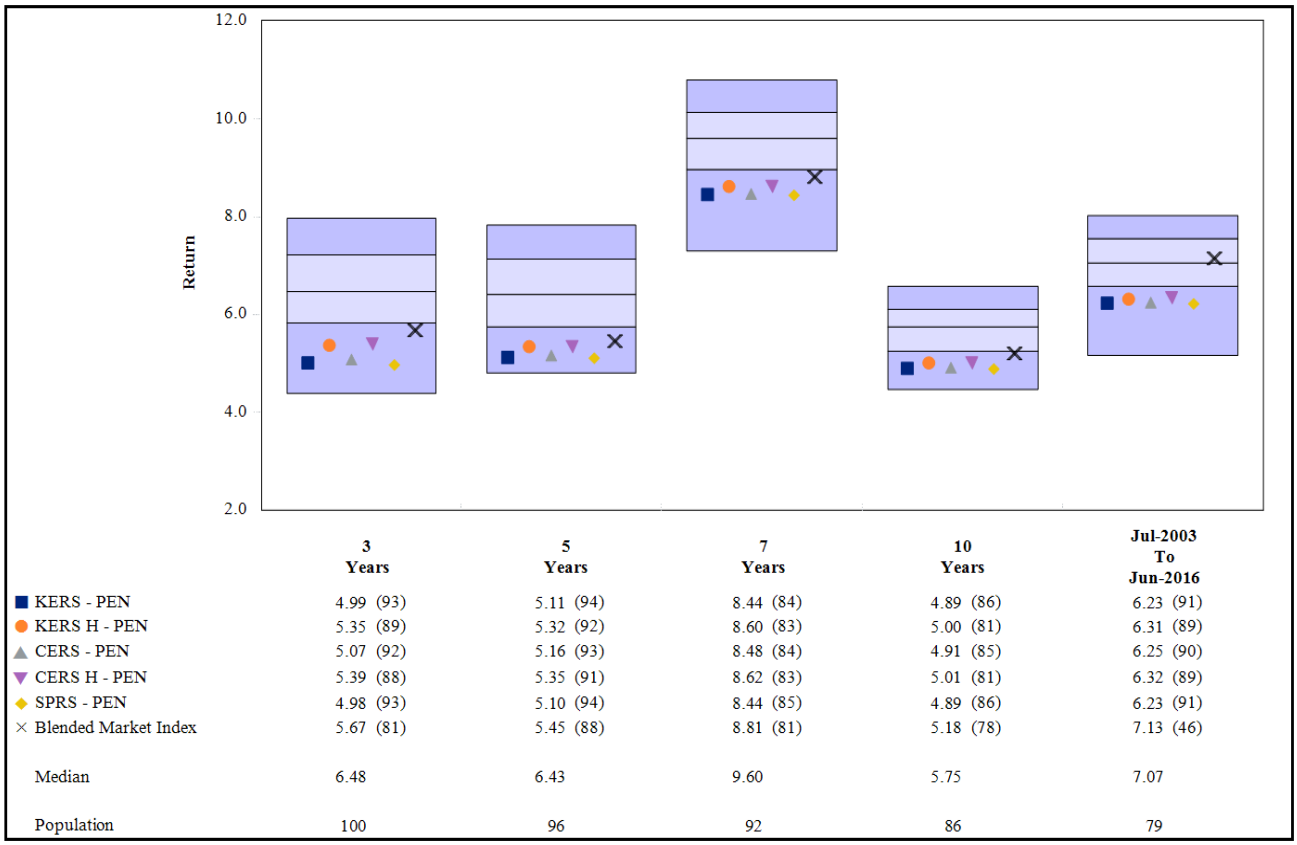
Table 54

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	*-0.75*	*-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*	*-0.14*
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*	*-0.41*	*-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*	*-0.22*	*-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 6/30/2016.

Figure 56

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 6/30/2016 and Investment Metrics peer group data

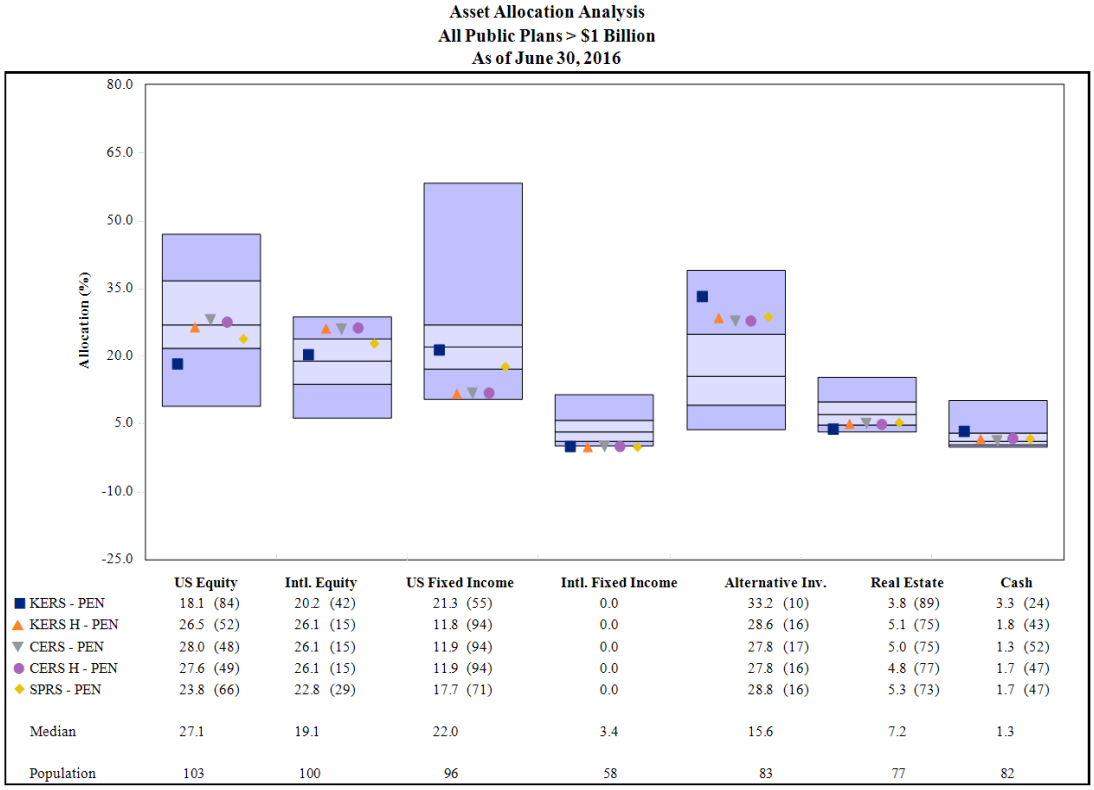
Asset allocation, with shifting targets over recent years, has been the primary detractor of relative KRS performance. This relative underperformance can be largely attributed to the following:

- International equity allocation increased from 40% of public equity to 50% of public equity in 2011 and has lagged the Russell 3000 Index by more than 1,100 basis points annually.
- Hedge fund allocation of roughly 10% was added in 2011 and has 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 has lagged its long-term benchmark (Russell 3000 Index + 3%).

When compared to a peer universe of public plans > $1 billion, the KRS plans have had an allocation to alternatives that is nearly twice as much as the peer average, falling in the top quartile of the universe. However, as mentioned above, the newly appointed Board has taken steps to significantly reduce the overall allocation to hedge funds in an attempt to lower costs, increase liquidity, and improve performance.

Figure 57

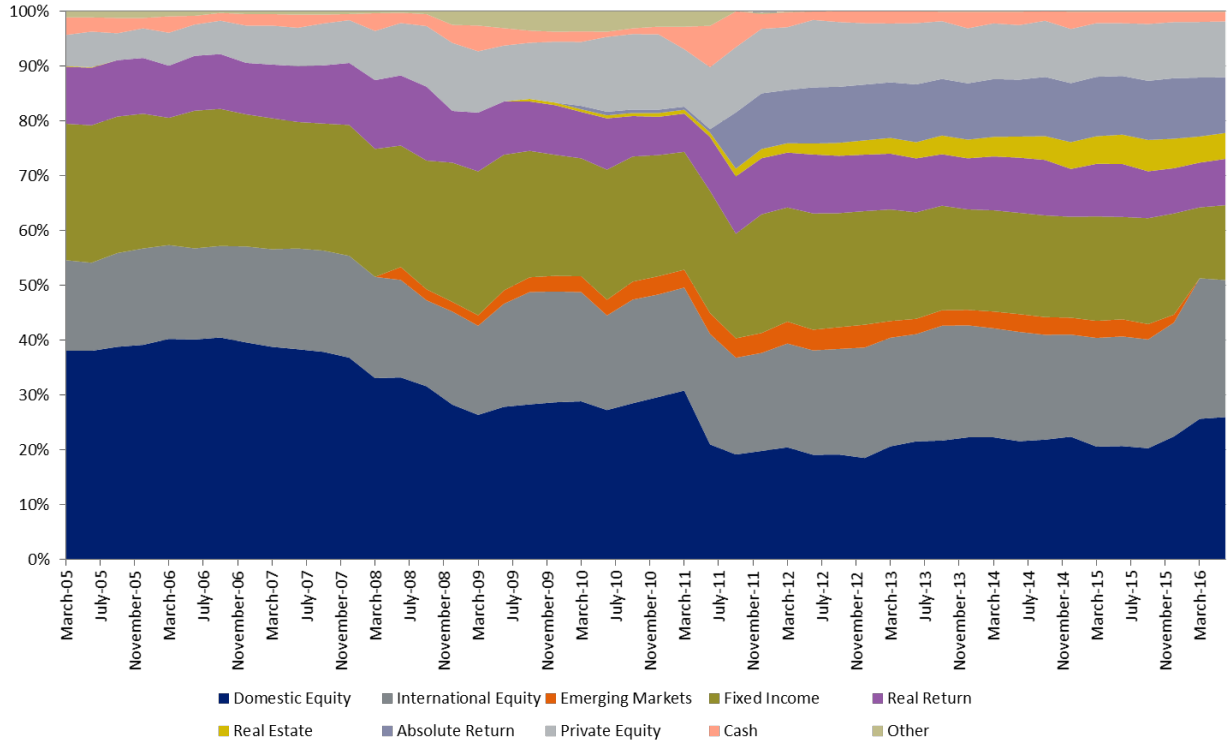


	US Equity	Intl. Equity	US Fixed Income	Intl. Fixed Income	Alternative Inv.	Real Estate	Cash
KERS - PEN	18.1 (84)	20.2 (42)	21.3 (55)	0.0	33.2 (10)	3.8 (89)	3.3 (24)
KERS H - PEN	26.5 (52)	26.1 (15)	11.8 (94)	0.0	28.6 (16)	5.1 (75)	1.8 (43)
CERS - PEN	28.0 (48)	26.1 (15)	11.9 (94)	0.0	27.8 (17)	5.0 (75)	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

Source: RV Kuhns Quarterly Investment Performance Reports as of 6/30/16 and Investment Metrics peer group data

Figure 58 depicts the historical asset allocation for the KRS Pension, based on RV Kuhns quarterly reports from 2005 – 2016. The addition of absolute return (hedge funds) in 2011 is clearly depicted, which coincides with a reduction in domestic equity and fixed income. The allocation to real estate has also increased since 2011, although more moderately than hedge funds.

Figure 58



Source: RV Kuhns Quarterly Investment Performance Reports

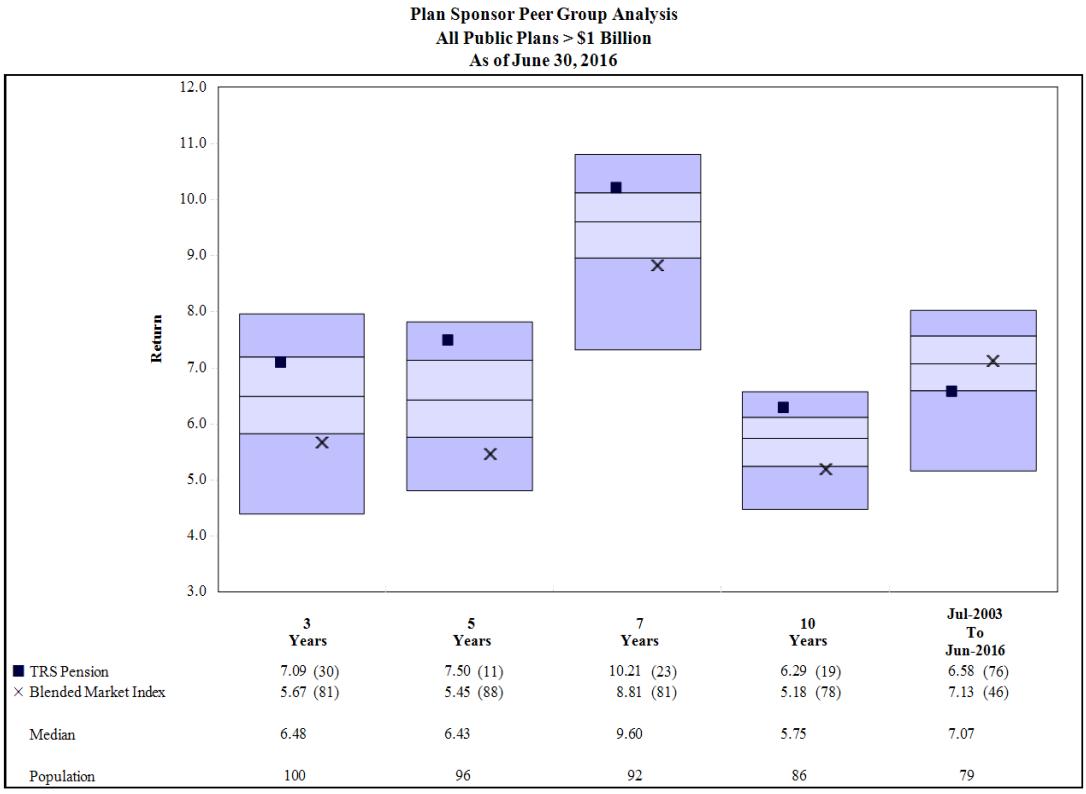
TRS Retirement Plans

When compared to a peer universe of public plans > $1 billion, the TRS Pension Plan's performance ranked in the 19th percentile over ten years (6.29% return) but only 76th since July 2003 (6.58% return), the beginning date of the monthly returns data provided by TRS. From FY 2009-2016, the Pension Plan's performance ranked above the 50th percentile in 6 out of the 8 fiscal year periods, but ranked close to the 90th percentile each year from FY 2004-2008. From a performance attribution standpoint, the following factors had a large impact on the relative performance of the Plan:

- 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 but has contributed to the outperformance from 2008-2015.
- The TRS Plan has become more aggressive over time, with fixed income representing 43% of the portfolio in March 2003 and gradually decreasing to 25% as of June 2016.

- The private equity allocation 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.

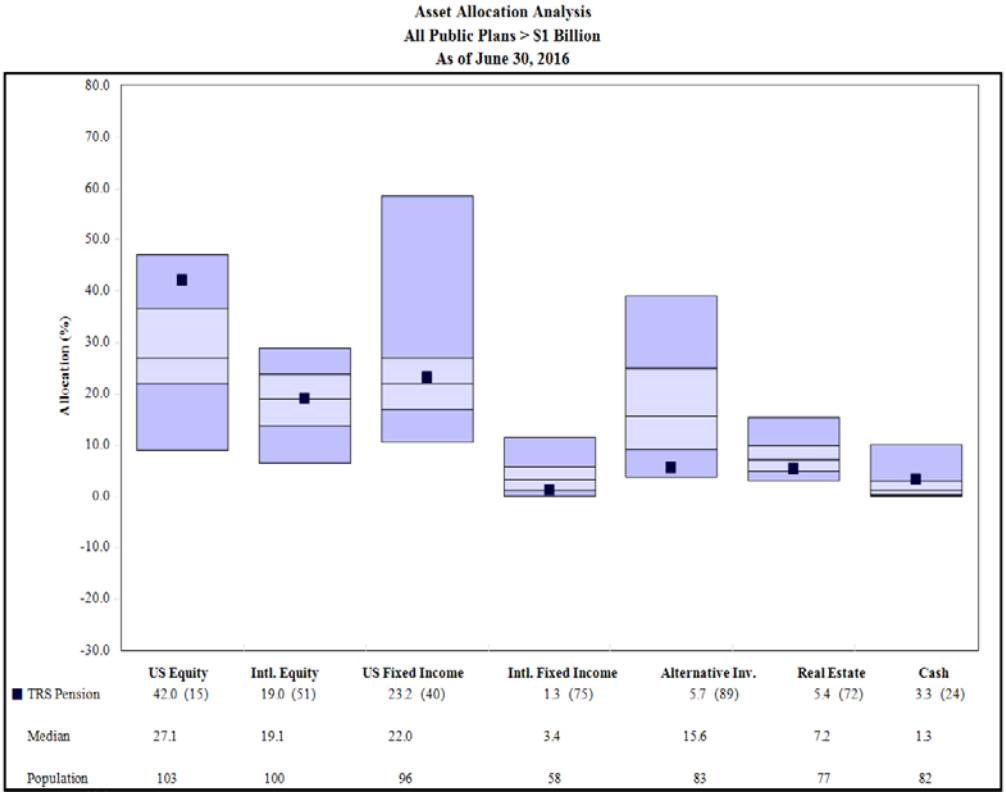
Figure 59



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

Unlike the KRS Retirement Plans, the TRS Pension Plan has a relatively low allocation to alternative investments, which falls in the bottom quartile of public plans > $1 billion. The result has been a relatively higher (top quartile) allocation to US Equity, which has been a major contributor to the plan's top quartile performance during the past 10 years, as can be seen in Figure 60 below.

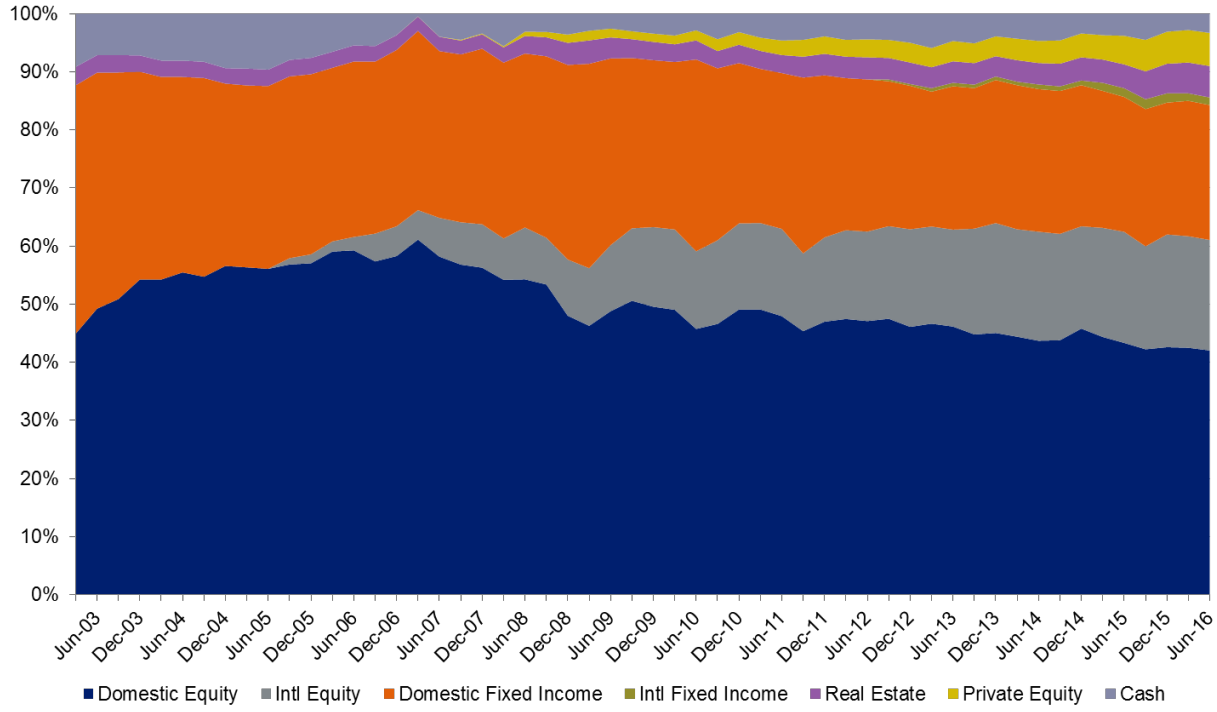
Figure 60



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

Figure 61 depicts the TRS historical allocation, based on the Segal RogersCasey quarterly reports from 2003 – 2016. The TRS portfolio has consistently been more heavily weighted to traditional equity and fixed income investments when compared to the KRS Pension Fund. Although international equity was only added to the portfolio in 2005, it has gradually increased to become a significant part of the overall equity allocation. As noted above, the plan has become more aggressive and risky over the period shown, with fixed income declining as international equity and private equity have gradually increased.

Figure 61



Source: Segal RogersCasey Quarterly Investment Performance Reports

Investment Expenses

The general trend towards a higher allocation to alternative investments has led to demands for greater transparency. Traditional equity and fixed income investments generally have a straightforward fee structure. However, alternative investments typically include both asset-based and performance-fees, hurdle rates, and other hidden costs. Roughly half of the costs incurred by private equity investments are related to performance-based fees typically not included in fee disclosures by state retirement plans[26].

Disclosure requirements in the industry have not kept pace with the rapid shift to alternative investments. GASB 67 states that "investment-related costs should be reported as investment expense if they are separable from (a) investment income and (b) the administrative expense of the plan". Separating performance-based fees for alternatives is difficult and not required by GASB, leaving little incentive for plan sponsors to address the issue. Although transparency is limited, reported fees for state plans increased from 0.28% in 2006 to 0.37% in 2012, largely due to an

26 CEM Benchmarking: "The Time Has Come For Standardized Total Cost Disclosure For Private Equity", April 2015.

increase in alternative investments[27]. However, reported fees are likely significantly understated as most state plans do not report performance-based fees and other hidden costs.

Best practices and recommendations regarding these important concerns were included in our Report #1 on Transparency and Governance.

Manager Fees

The internal KRS report includes fee schedules for all underlying managers, but is inconsistent with fees shown in the report from the KRS advisor, RV Kuhns (KRS report footnote indicates there are cases where actual fees negotiated are lower than shown, and RV Kuhns report fees are generally lower). In both KRS reports, the fees listed do not include any performance-based fees or other hidden costs and do not include administrative/operational costs of internally managed accounts. The RV Kuhns reported fees are shown below for major categories.

Table 55

	Overall Weighted Average	Fixed Income	US Equity	Non-US Equity	Real Return	Absolute Return	Private Real Estate	Private Equity (KRS)/ Alternatives (TRS)
KRS Pension	0.53%	0.43%	0.12%	0.31%	0.82%	0.93%	1.06%	1.31%
KRS Insurance	0.51%	0.47%	0.13%	0.34%	0.79%	0.89%	1.05%	1.35%
TRS Pension	0.26%	0.01%	0.13% (aggregated)				0.78%	1.60%
TRS Medical	0.34%		0.06% (aggregated)				2.80%	4.35%
National Benchmark (Median or Range)	0.34%	0.35%	0.75%	0.80%	1.0 - 1.5%	1.0 - 2.0% Mgmt + 10 - 20% Carry	1.0 - 2.0% Mgmt + 10 - 20% Carry	1.0 - 2.0% Mgmt + 10 - 20% Carry

Sources: KRS: RV Kuhns & Internal Report as of 6/30/16; TRS: Internal Report for year ended 6/30/16; National Benchmark (overall): PPOB Investment Expense Report, 2/22/16; National Benchmark (asset class): eVestment Alliance for Fixed Income, US Equity & Non-US Equity and PFM manager research database for alternatives managers

The overall reported expense ratios for the TRS Plans are lower than KRS. However, this does not include the cost of internally managed funds for TRS, which represent roughly 30% of the total TRS assets for Pensions and 10% for Medical. The costs for TRS real estate and private equity managers are also likely understated, and some reporting inconsistencies remain to be reconciled. In addition, as KRS transitions out of high fee hedge funds, overall average costs should decline.

Potential Impact of Segregating Assets

Aggregating assets among all KRS plans has resulted in significant purchasing power.

27 The Pew Charitable Trusts: "State Public Pension Investments Shift Over Past 30 Years", June 2014.

- Pension (6/30/2016): $10.8b (KERS: $1.9b; KERS H: $0.5b; CERS: $6.1b; CERS H: $2.0b; SPRS: $0.2b)
- Insurance (6/30/2016): $4.2b (KERS: $0.7b; KERS H: $0.4b; CERS: $1.9b; CERS H: $1.1b; SPRS: $0.2b)

More than one-third of the portfolios are invested in managers with tiered fee schedules. Separating CERS assets from the other plans will reduce purchasing power and result in higher fees based on the current tiered fee schedules. The CERS weighted average fees would remain largely unchanged if they could retain the same contract terms, increasing by less than 1bp ($450k for Pension, $210k for Insurance). However, KERS & SPRS weighted average fees would be more impacted due to smaller asset size, increasing by roughly 3bps ($805k for Pension, $260k for Insurance). These estimates are based on the manager fee schedules outlined in RV Kuhn's quarterly report plus the private equity manager fee schedules from the internal KRS report. The fee impact noted above is likely understated as it would also limit the ability to negotiate reduced fees in the future as the aggregate asset size is reduced if the plans are separated. This may also impact KRS' ability to negotiate fees with other providers (i.e. consultants, custodian, etc.). Lastly, separating illiquid alternative assets (private equity, etc.) may not be possible in near-term.

Third-Party Provider Fees

KRS uses four different investment advisors/consultants:

- RV Kuhns (General Advisor) charged $395K in 2011 and increases annually by greater of 2% or CPI plus $20K per custodian search and $55K per asset/liability study.
- ORG Portfolio Management (Real Estate Advisor) charged $275K in 2008 and increases annually by CPI.
- Pension Consulting Alliance (Private Equity Advisor) charged $375K in 2014 and increases annually by 3%.
- Albourne America (Hedge Funds & Real Assets Advisor) charges $240K annually for hedge fund advisory and $240K annually for real assets advisory, plus minor costs for additional scope.

Bank of New York Mellon is the custodial bank for KRS. They charge 0.15bps for US assets under custody and 0.50bps – 90bps for non-US assets depending on market, plus various fees for trading and additional services (compliance, performance reporting, portfolio analytics, etc.)

TRS lists expenses for three consultants in the 2016 CAFR:

- Aon Hewitt ($358,850)

- Bevis Longstreth ($50,137)
- George Philip ($38,962)

Bank of New York Mellon is also the custodial bank for TRS. The 2016 CAFR shows an expense of $380,233 (Pension) and $30,275 (Medical).