
**REPORT
TO ORSC**



**ACTUARIAL AUDIT
FOR THE
HIGHWAY PATROL RETIREMENT SYSTEM**

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September 2022



September 12, 2022

Ohio Retirement Study Council
Columbus, OH 43215

Re: Ohio Highway Patrol Retirement System (HPRS) Actuarial Audit of the Pension and Health Benefits as of December 31, 2020

Dear ORSC Members:

We have completed our actuarial audit of the Ohio Highway Patrol Retirement System (HPRS) pursuant to R.C. §171.04(E). As shown in the attached findings, we have matched actuarial calculations quite closely and have several related comments.

One major observation is that despite the occasional granting of Cost-Of-Living-Adjustments (COLAs), the actuarial calculations are based on the assumption that no future COLAs would ever be granted. Recognition of this assumption would increase the actuarial liabilities and push the funding period to a longer period, likely more than thirty years. The Actuarial Standards of Practice, as well as the Government Accounting Standards, require that the actuarial assumptions reflect the best estimate of future experience. We believe that this estimate should reflect the likelihood of occasional COLAs being granted if that is the case.

A second significant concern is that the actuary uses a more optimistic mortality basis than is used by the vast majority of public pension actuaries. While nearly every statewide retirement system assumes that mortality rates will improve over the next generations, Foster & Foster, the HPRS actuary, assumes that mortality rates will not improve beyond 2025. Our best estimate is that mortality rates will decrease somewhat after 2025. The current actuary's best estimate is that they will not. Incorporating the more conventional approach of mortality improvement beyond 2025 would also increase the funding period. Our calculations show that the two changes combined would result in a 34-year funding period.

None of the other comments reflects a critical concern. Our audit finds that actuarial calculations themselves were reasonable, consistent and accurate.

The undersigned are members of the American Academy of Actuaries and meet the Qualification Standards to provide this statement of actuarial opinion.

We are available to answer any questions you may have regarding our findings and recommendations of the actuarial audit.

Sincerely,



William B. Forna, FSA
President
Pension Trustee Advisors



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Consulting Actuary
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cc: Highway Patrol Retirement System

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Section 1 – General Findings

The Ohio Revised Code §171.04(E) requires that the Ohio Retirement Study Council (ORSC) contract for an independent audit of the state retirement systems' actuaries not less than once every ten years. ORSC elaborated that the firm conducting the audit is to express an opinion regarding:

- An overall opinion as to the validity, completeness, and appropriateness of the demographic and financial information used by the consulting actuary to meet the Highway Patrol Retirement System's (HPRS') financial objectives;
- An overall opinion as to the reasonableness of the consulting actuary's conclusions and the conformance of the consulting actuary's work with generally accepted actuarial standards and practices;
- A detailed description of each audit exception and the estimated effects of each exception on HPRS; and
- Detailed recommendations for improvement.

The following pages will discuss our opinion with respect to these standards.

HPRS provides retirement benefits and health care benefits. Actuarial values were reported through two actuarial reports:

- HPRS Actuarial Valuation Report as of December 31, 2020, dated August 2021
- HPRS Retiree Health Care Benefits Plan Actuarial Valuation Report as of December 31, 2020, dated August 2021

We have duplicated these December 31, 2020 actuarial valuations conducted by Foster & Foster, the HPRS actuary, and the results match quite closely. This match confirms that Foster & Foster is able to capture the complexity of HPRS accurately and that HPRS should have confidence in the actuarial calculations provided to them. In addition, we reviewed Foster & Foster's May 18, 2020 Quinquennial Actuarial Experience Study for January 1, 2014 to December 31, 2018 and its recommendations. With exception of the COLA assumption and the assumption for future mortality improvement rates, we found that the assumptions proposed by Foster & Foster, adopted by the Board, and utilized by Foster & Foster were reasonable. We look forward to Foster & Foster considering our comments when they conduct their reviews of assumptions in future years.

A key purpose of an actuarial audit is to confirm that there are no significant errors in the actuarial calculations. Based on our replication, we report that we have found no significant discrepancies and conclude that there are no significant calculation errors.

Despite no significant *calculation* errors, we have two significant concerns. First is that Foster & Foster assumes that there will be no future Cost-of-Living-Adjustments (COLAs) other than a single 3.00% increase in 2022. While the assumption of no future COLAs may have been plausible when

first established in the December 31, 2018 valuation, we do not believe that the assumption that HPRS will never grant another COLA is likely to be accurate. In fact, the HPRS Board has adopted a funding policy which contemplates COLAs of up to 3% if the plan is adequately funded. The fallacy is that the current method for measuring if the plan is adequately funded creates a “loophole” where if the actuary assumes that this is the “one-and-only” COLA, then the plan is adequately funded, but if the actuary realistically assumes that COLAs might be granted, then much smaller COLAs would be granted under the Board policy.

Our second significant concern is that unlike the vast majority of actuaries practicing in public pensions today, Foster & Foster assumes that mortality rates will not decrease in future generations but will only decrease until 2025. Although this may be their “best estimate” of future mortality experience, it is not the “best estimate” of actuaries for nearly all statewide retirement systems, who use a “fully generational” mortality approach.

We have included our calculations of costs under a 1.25% future COLA assumption, plus a fully generational mortality approach in addition to those reported by Foster & Foster and our replication of those.

These are illustrated on the tables and discussion below.

The following tables summarize the actuarial liabilities and normal costs produced by Foster & Foster and PTA/KMS actuarial valuations.

Actuarial Liabilities and Normal Cost as of December 31, 2020 - Pension Benefits			
(\$ in thousands)			
	Actuarial Replication		
	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff</u>
Accrued Liability	1,203,887	1,209,114	0.43%
Normal Cost	21,606	21,638	0.15%
	1.25% COLA		
	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff</u>
Accrued Liability	1,203,887	1,279,138	6.25%
Normal Cost	21,606	22,696	5.04%
	1.25% COLA & Mortality*		
	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff</u>
Accrued Liability	1,203,887	1,295,729	7.63%
Normal Cost	21,606	23,133	7.07%

Actuarial Liabilities and Normal Cost as of December 31, 2020 - Health Care Benefits			
(\$ in thousands)			
	Actuarial Replication		
	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff</u>
Accrued Liability	285,328	287,679	0.82%
Normal Cost	5,196	5,277	1.55%
	Mortality*		
	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff</u>
Accrued Liability	285,328	295,625	3.61%
Normal Cost	5,196	5,550	6.81%

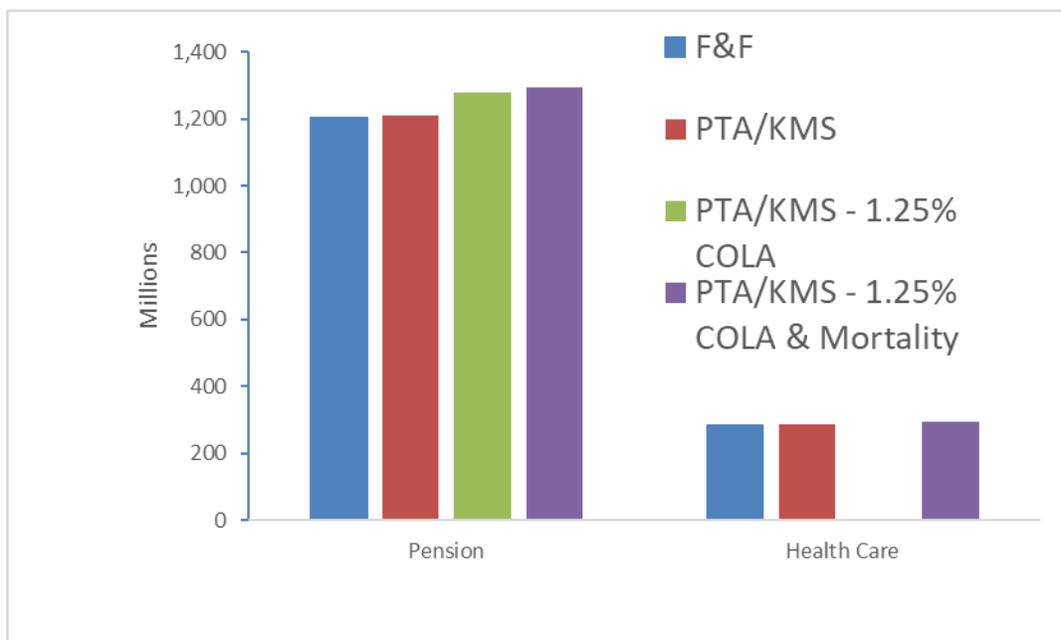
* Fully generational mortality improvement rates.

The grand total actuarial liability calculated by PTA/KMS in the actuarial replication was within 0.5% of the same calculated by Foster & Foster. Our grand total normal cost was within 0.2% of that calculated by Foster & Foster. Both are well within actuarial norms and strong evidence that the Foster & Foster actuarial valuation calculations are reliable.

However, based on a more realistic COLA assumption of 1.25%, the actuarial liabilities would be 5.8% higher and the funding period would increase to 31 years. If the mortality basis was also changed to be more realistic, the liabilities would increase by a total of 7.2% and the funding period would be 34 years. The following shows the actuarial impact:

Actuarial Valuation as of December 31, 2020	As Reported	Reflect COLA	COLA & Mortality
COLA Assumption following 2022	0%	1.25%	1.25%
Mortality Improvement	Only through 2025	Only through 2025	Indefinite
Unfunded Liability	\$359 million	\$429 million	\$446 million
Funded Percentage	70.2%	66.3%	65.5%
Funding Period	22 years	31 years	34 years

The differences in accrued liability under the actuarial replication, 1.25% COLA and 1.25% COLA including full generational mortality (mortality only for Health Care) are illustrated by the following chart:



Although the match was reasonably close when conducted without future COLAs or projected mortality improvement beyond 2025, there is still room for improvement. We make the following general recommendations for enhancement in the accuracy of calculations and completeness in the reports:

- Expand disclosure of methodology and assumptions more rigorously in the next actuarial experience study and valuation reports
- Reconsider certain actuarial assumptions in the next experience study, including:
 - Number of dependents
 - Administrative expenses
 - Real salary growth
 - Gross claim rate derivation
 - Morbidity
 - Health care trend rates
 - Health plan participation rates and elections

Our full set of recommendations is included in greater detail in Section 4.

Section 2 – Audit of Actuarial Methods, Factors and Assumptions

The first step in the actuarial audit process is to review the actuarial methods, actuarial factors, and actuarial assumptions used in the actuarial valuations.

ACTUARIAL METHODS

Foster & Foster uses several actuarial methods in determining costs and liabilities for HPRS.

- The actuarial funding method is the Individual Entry Age actuarial cost method.
- The actuarial asset valuation method for pension is a four-year smoothed market value.
- The amortization of the unfunded actuarial accrued liability is based on a level payroll. This results in a period of 22 years as of December 31, 2020.
- The method of developing the health care claims cost assumptions is not clearly described in the reports.

Actuarial Funding Method

The Individual Entry Age Normal actuarial cost method is used for both actuarial valuations. This method is designed to maintain constant plan costs throughout each employee's career as a portion of pay. We believe this is a reasonable and appropriate method. It is the most common method used by public pension systems such as HPRS. Foster & Foster is applying the method reasonably, consistently, and accurately.

Actuarial Asset Valuation Method

Foster & Foster employs a four-year smoothed market value actuarial asset valuation method for the retirement plan actuarial valuation. Unlike actuarial funding methods, actuarial asset valuation methods are not precisely defined. Most actuaries use what could be categorized as a four-year or five-year smoothed market value actuarial asset valuation method as does Foster & Foster but might use different methods. We have reviewed the precise provisions of the method that Foster & Foster employs and find them to be reasonable, consistently applied, and accurate.

The method is a conventional and appropriate application of a four-year smoothed method. The method spreads any investment gains or losses (relative to the actuarial assumption) over four years and applies a 20% maximum disparity from true market value. This is a reasonable and appropriate method. This 20% corridor and four-year smoothing has been in place since 2002 when a 12% corridor was changed to the current 20%.

Only once in the period that the 20% corridor has been in place (2002 through 2020) did the corridor actually apply, and that was 2008. OP&F and SERS utilize this common 20% corridor, while STRS has a 9% corridor and PERS has a 12% corridor.

Amortization Method

In addition to the Entry Age Normal actuarial cost method, Foster & Foster and HPRS use a conventional method for amortizing components of unfunded liability. The method has found that the unfunded liability is being amortized over a period which has decreased from 30 years as of December 31, 2013, to 22 years as of December 31, 2020.

The funding period is calculated by subtracting the employer normal cost from the total employer contributions, and then measuring how many years it would require to fully amortize the unfunded retirement liability from these contributions. While this would tend to decrease every year (by one year if all actuarial assumptions are met), there may be years when the period rises, stays the same, or falls by more than the expected one year.

Some statewide pension systems continue to use an open period to amortize the unfunded liability. A closed period approach tends to be more conservative than the open period approach. As discussed in our 2011 Pension Reform Solutions report, we believe that a closed period is more appropriate for Ohio retirement systems.

The other amortization feature being used is to amortize the costs as a constant percentage of payroll. With payroll growing at an assumed rate of 3.00% per year, this is designed to maintain steady costs. An alternative would be to amortize costs in constant dollars, which would result in higher costs in early years when expressed as a percentage of pay. We believe the current method is a reasonable approach for funding, despite the GASB rules which do not permit this method for GASB determinations. The 3.00% payroll growth rate is reasonable in the aggregate based on a stable population. Note that this was reduced from 3.50% as a result of the Foster & Foster recommendation in the experience study. We support this recommendation.

In conclusion, we find the amortization method reasonable, consistent, and accurate.

ACTUARIAL ASSUMPTIONS

We have reviewed the actuarial assumptions used by the actuary and find them to be reasonable, consistent, and accurate. Our review included the Foster & Foster Quinquennial Actuarial Experience Review for 2013 through 2018. We encourage Foster & Foster and the HPRS Board to consider our comments in the process of adopting proposed assumption changes.

The actuary uses many actuarial assumptions, including:

- Demographic Assumptions
 - Post-Retirement Mortality
 - Disabled Post-Retirement Mortality
 - Pre-Retirement Mortality
 - Withdrawal from Service Before Retirement

- Retirement
- Disability Retirement
- Other Demographic Assumptions
- Economic Assumptions
 - Investment Return Rate
 - Inflation
 - Wage Inflation
 - Individual Salary Increases
 - Cost of Living Adjustments
- Post-Employment Healthcare Assumptions
 - Gross Claim Rate Derivation
 - Health Care Cost Trend Rate
 - Morbidity
 - Health Plan Participation Rates and Elections

Detailed comments on each assumption are included below.

DEMOGRAPHIC ASSUMPTIONS

Demographic Experience Since the 2019 Investigation

Experience in the past two years, since the prior experience investigation, indicates that the demographic actuarial assumptions have generated cumulative actuarial gains of 0.1% over two years. This is an indication that the demographic assumptions in aggregate during this 2-year period have been a very reasonable measure of anticipated experience.

Demographic Actuarial (Gains)/Losses By Component (\$thousands)

Source	FY 19	FY 20	Total
Salary/Service Increase	1,712	(504)	1,208
Retirement	(4,224)	(2,787)	(7,011)
Retiree Mortality	5,697	(670)	5,027
All Other	(2,323)	(384)	(2,707)
Total (Gain)/Loss	862	(4,345)	(3,483)
Actuarial Liability (\$millions)	1,173	1,204	1,204
Gain/Loss as % of FYE Liability	<.1% Loss	0.4% Gain	0.3% Gain

Rates of Post-Retirement Mortality

Gabriel, Roeder, Smith & Company (GRS) – the prior actuary - recommended in their experience study report covering the period January 1, 2010 to December 31, 2014 that HPRS change the mortality projection basis from a static projection scale to a generational projection scale. This was a substantial enhancement to the actuarial methodology because it recognized likely future mortality improvement. Mortality improvement projection is a critical issue in the measurement of pension liabilities and costs. However, when Foster & Foster began to serve as actuary, they substantially reverted to the prior practice by limiting the mortality improvement to only five years. This was a significant step backward in actuarial methodology and had the impact of lowering costs and liabilities. This practice of limiting mortality improvement to five years continues to the current actuarial valuation.

Actuaries are getting more sophisticated in their techniques for anticipating future mortality improvements. The more sophisticated method is known as a “generational” mortality table which assigns different mortality probabilities based not only on age but on generation. For example, an 80-year old retiree in 2022 (born in 1942) would have higher mortality rates than a future 80-year old retiree born in 1987. The other four Ohio retirement systems, and nearly all statewide retirement systems use generational mortality tables, as did GRS for HPRS prior to

Foster & Foster. This methodology is strongly recommended (if not required) by the actuarial standards of practice.

Foster & Foster uses a “stripped-down” version of generational mortality where they assume that mortality will only improve for the next five years. This was a common technique in the late 1990’s and early 2000’s when actuaries wanted to recognize some mortality improvement, but not permanent mortality improvement.

Actuarial Standard of Practice #35 on *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations* paragraph 3.2.5 states that the assumptions should “reflect the actuary’s best judgement” and “reflect the actuary’s estimate of future experience.” This implies that Foster & Foster’s best judgement and estimate is that there will be no further improvement in mortality after 2025. Their statement “*We feel these assumptions sufficiently accommodate anticipated future mortality improvements*” indicates that this is their best judgement. We do not share this judgement and believe that most other public pension actuaries would not either.

Many trends have contributed to lengthening life expectancies, including:

- Continued eradication of diseases
- Advances in medicine
- Advances in nutrition
- Improved access to medical care

But other trends may suggest that life expectancies may not continue to improve, including:

- Emergence of new diseases including COVID-19 and potential future variants
- Obesity
- Many factors which improved mortality are one-time, and cannot be repeated, for example, smoking cessation trends (one can only quit smoking once)
- More sedentary lifestyles
- Substance abuse
- Climate change

As a result of the uncertainty of these contrary trends, we encourage Foster & Foster to rigorously study 2020, 2021 and 2022 experience and the appropriate application of projection scales beyond a mere five years. They may choose to incorporate different short-term and long-term mortality improvement scales. The Society of Actuaries has also developed more recent projection scales such as MP-2021.

The table above illustrates that over the two-year period, the retiree mortality assumptions have generated actuarial losses of \$5 million, while the current retiree actuarial liability is \$740

million. Although this is less than 1%, it reflects only two years of decreased mortality, and because HPRS is a small group, with only 1,730 members collecting benefits, an analysis of this retiree mortality experience may not be credible. We believe that there will be some ongoing mortality improvement beyond 2025. Pending Foster & Foster's consideration of COVID and incorporation of a full generational mortality approach, we would anticipate an increase in actuarial liabilities and costs due to this change. Our estimate is that a fully generational mortality basis, along with a 1.25% post-2022 COLA assumption would further increase the funding period to 34 years and further decrease the funding ratio to 65%.

As an example of this impact of this limited projection of mortality improvement, consider a male member age 30 today. Foster & Foster assumes that this individual would have an average life expectancy through age 83.5. But if they used a fully generational mortality basis, they would be expected to live on average to 86.8 – more than three years longer.

All four other Ohio retirement systems use a generational mortality basis, as did HPRS prior to 2019. We have gathered information on highway patrol systems in Indiana, Pennsylvania and Kentucky and they also use fully generational mortality. We are not aware of any state retirement system today using anything but a fully generational mortality basis. We cannot think of any reason why the troopers that are being hired today in Ohio won't live as long as the OPERS law enforcement hires, the Police hires, or troopers hired in Indiana, Pennsylvania and Kentucky.

Rates of Disabled Post-Retirement Mortality

Foster & Foster uses a standard table for disabled retirees. We find this reasonable, but believe that it should be projected for improvement beyond merely 2025. This is not a particularly critical assumption, as many more retirees are non-disabled, or healthy, than disabled.

Rates of Pre-Retirement Mortality

The pre-retirement mortality assumption also appears reasonable, but we believe that it should be projected for improvement beyond merely 2025. Very few active members die, so the use of a standard mortality table is generally appropriate.

Withdrawal from Service before Retirement

We find that the withdrawal tables used by Foster & Foster are reasonable, consistent, and accurate. Foster & Foster uses a table based on service. We find that this is a sound methodology because individuals do have higher likelihood of termination during their first few years of employment than later in their careers. Some actuaries use a table based instead on age, which we find is a less predictive variable in determining ones likelihood of termination than is service.

The 2014 through 2018 experience study appropriately balanced prior assumptions with more recent experience and considered the credibility of the data effectively.

Retirement

We also find that the retirement tables used by Foster & Foster are reasonable, consistent, and accurate. Varying retirement rates by age are used for normal retirements as well as for early retirements. Note from the table at the beginning of this section that the two-year experience is a gain of \$7 million. This possibly indicates that members are retiring a bit later than anticipated. As Foster & Foster conducted the 2014-2018 experience study, they did review the experience and their suggestions seem reasonable. In a few instances, where actual experience was different from expected experience, they adjusted the rates slightly beyond what the actual experience supported. For example, during the five-year period, the prior assumptions would have predicted 14.4 retirements at age 48 of the 48 members who attained age 48 (30%). But only 10 actually did retire (20.8%). The new assumption was reduced to 20.0%, although that was slightly less than the 20.8% observed. We would have probably not made such a significant change (perhaps 21% to 25%), but the differences between what we may have recommended and what Foster & Foster recommended are not significant. We encourage Foster & Foster to be somewhat more analytical when changing assumptions in the next experience study.

Other Demographic Assumptions

We reviewed the other demographic assumptions which could be analyzed by Foster & Foster. We find their study reasonable, consistent, and accurate. These assumptions include:

Disability Rates – Foster & Foster uses an assumption for disability retirement which is 0.06% at ages 25 and under, increasing to 1.00% at age 55. This is based partially on five-year experience where only 26 members retired from disability. Foster & Foster assumes that 55% of the disabilities are service related. We find these assumptions reasonable.

Marriage Rates – Foster & Foster assumes 80% of future retirees will be married. Current retirees use actual marriage data at the time of valuation. We support this approach.

Age Difference between Husbands and Wives – Foster & Foster assumes female retirees are three years younger than their husbands and that male retirees are three years older than their wives. We find this reasonable. Many retirement systems use three years as a widely established norm. Given the scant volume of HPRS data available, we see no reason that Foster & Foster make detailed analyses in future experience studies.

Number of Dependents – Foster & Foster assumes that members who receive a death-in-service benefit are assumed to have two children for whom benefits are paid for 10 years. For the health valuation, the percent of retirees electing coverage for a covered spouse was not disclosed, but we assumed 80% had covered spouses based on the pension valuation. Foster & Foster assumes a retiree enrolled in a member plus child(ren) or member plus family health plan are expected to cover one child to two children, respectively, for 10 years. We find these assumptions reasonable, but encourage Foster & Foster to disclose the 80% in the health report, and to attempt to gather data on children so that it can be studied in the next experience study.

Military Service Purchase – Foster & Foster simply adds 0.75% of payroll to cover the cost of subsidized military service purchases. We recommend that this be explicitly studied in the next experience investigation. This assumption has a significant impact on actuarial valuation results and would be worthwhile to understand the true cost of military service purchases.

Retiree Health Participation – Foster & Foster uses a table of participation rates for medical, dental and vision coverages for retirees and spouses based on member ages. We recommend a more robust analysis of actual participation rates in the next experience study as well as disclosing more robust rationale in the use of these rates.

ECONOMIC ASSUMPTIONS

Investment Return Rate

GRS in 2018 reduced the assumed rate of investment return from 7.75% to 7.25%. This assumption change was a bit “ahead of the curve” with respect to rates used by most systems in 2017, when 7.50% was the rate most commonly used. Today, however, 7.00% is the median return of large U.S. retirement systems according to the Public Funds Survey.

HPRS did not recommend lowering the rate from 7.25% to 7.00% following their experience study. That was reasonable and continues to be reasonable, but perhaps a recommended reduction will be made in the next experience study.

Actuaries are required under their standards of practice to opine if they believe that the rate is not reasonable. Even though experience investigations are typically conducted only every five years, this standard applies each year.

The 7.25% rate is somewhat consistent with the statewide systems in Ohio, but slightly higher than the national average (6.99%). The other systems’ expected rates are:

- Ohio Police and Fire Pension Fund – 7.50% (reduced from 8.00% effective February 2022)
- School Employees Retirement System of Ohio – 7.00%
- Ohio Public Employees Retirement System – 6.90% (reduced from 7.20% effective 2022)
- State Teachers Retirement System of Ohio – 7.00%

Of course, a simple comparison of what other systems are using is helpful, but it is not a sufficient criterion for establishing an assumed rate of investment return.

Foster & Foster used a robust forward-looking “building block” method, where they developed an inflation assumption, a real return assumption and an assumption for expenses. Each of these components was calculated independently, then summed (net of expenses) to develop the net investment return assumption.

Their 7.25% net investment return assumption recommendation was comprised of 2.50% inflation plus 4.75% real return net of administrative expenses. Inflation is discussed in the section below, so we will focus on the real return component and the administrative expense component.

Based on our experience, investment consultants continue to pare back their expectations for future returns. This is partially a consequence of continued low inflation expectations and short-term fixed income rates, but can also be on a real return basis. Consequently, we would expect that it is likely that in the next experience study, Foster & Foster would possibly suggest another drop in net return assumption or maintain the 7.25% rate until conditions change.

In particular, recent inflation hints that the continuing decline in expected rates of return may be tapering. We trust that Foster & Foster rigorously analyzes both the expected real return as well as the inflation assumption.

According to state data from the Public Funds Survey as of March, 2022, the average real rate of return assumption for 119 state systems, 47 of which disclosed this, is 4.53%. Although not specifically asked, this is presumably after reduction for administrative expenses in most responses.

The 4.75% real rate currently used by HPRS is fairly consistent with the rates used by the statewide systems in Ohio. The other systems' expected real rates of return are:

- Ohio Police and Fire Pension Fund – 5.25% (probably to be reduced by as much as 0.50% effective 2022)
- School Employees Retirement System of Ohio – 4.60%
- Ohio Public Employees Retirement System – 4.70% (possibly to be reduced effective 2022)
- State Teachers Retirement System of Ohio – 4.50%

Administrative Expenses – Foster & Foster reported that HPRS' anticipated administrative expenses are incorporated into development of the assumed rate of return implicitly, because the expected returns by asset class are assumed to be net of administrative expenses. We recommend that Foster & Foster incorporate a more thorough analysis of this assumption, particularly for asset classes where returns are sometimes calculated gross of their investment expenses. We recommend that Foster & Foster also incorporate a robust expense assumption in the next experience investigation.

Health Care Plan Rate of Investment Return – Foster & Foster uses the same 7.25% investment return assumption for the healthcare valuation as is the assumed return from plan assets. This is appropriate because the plan is funded and expected to remain so.

Inflation

We reviewed the development of the 2.50% inflation rate used by Foster & Foster. We find that the assumption is reasonable. The experience investigation considered economists' forecasts to the extent that they are not purely short term. We encourage Foster & Foster to also consider forward looking data such as the yields on inflation-indexed treasury bonds. This is particularly valuable in the current environment, where headline inflation is high, but the bond markets continue to anticipate modest long-term inflation.

According to the Public Funds Survey data cited above as of March, 2022, the median inflation assumption for those who reported their inflation rate is 2.55%.

A 2.50% rate is also consistent with the other statewide systems in Ohio. The other systems' expected inflation rates are:

- Ohio Police and Fire Pension Fund – 2.75% (likely to be reduced effective 2022)
- School Employees Retirement System of Ohio – 2.40%
- Ohio Public Employees Retirement System – 2.50%
- State Teachers' Retirement System of Ohio – 2.50%

Wage Inflation

Foster & Foster proposes a real wage inflation, or payroll growth rate, of 0.50%. When added to 2.50% inflation, this results in a total payroll growth assumption of 3.00%. We find this to be reasonable, consistent, and accurate. Foster & Foster provided a robust analysis in support of this assumption in its experience study. We fully support Foster & Foster's recommended reduction in this rate from 3.50% to 3.00% that was made in its experience study.

Individual Salary Increases

Foster & Foster analyzed individual salary increase rates and made recommendations for minor increases. We found this to be appropriate. We find that it is critical to analyze *real* (inflation-adjusted) salary growth and not merely nominal salary growth. Inflation averaged less than 2.00% during the five-year period, compared with the assumed rate of 2.50%. There will likely be another disparity in the next experience study. Thus it will be particularly appropriate that Foster & Foster reflect this gap between actual and expected inflation. If Ohio is like other employers, wage increases will not quite keep up with the current high rate of inflation. But it will be likely that increases are higher than the actuarial expectations (which are based on 2.5% inflation). If that is the case, Foster & Foster should not again increase salary growth assumption rates, if they don't even keep up with (actual) inflation. We encourage Foster & Foster to use this methodology in its experience study and not merely study nominal salary growth.

Cost of Living Adjustments

The following table illustrates the COLAs granted as well as the assumptions made by the actuary at the time:

Year	COLA Granted	COLA Assumed
2011	3.00%	3.00% all years
2012	3.00%	3.00% for 2013, 1.50% for 2014, 1.25% thereafter
2013	3.00%	1.50% for 2014, 1.25% thereafter
2014	1.50%	1.25% all years
2015	1.25%	1.25% all years
2016	1.25%	1.25% all years
2017	1.25%	1.25% all years
2018	1.25%	1.25% for 2019, 0% thereafter
2019	1.25%	1.25% for 2019, 0% thereafter
2020	0.00%	0% for 2021, 3% for 2022, 0% thereafter
2021	0.00%	Not yet reported
2022	3.00%	Not yet reported
2023	3.00%	Not yet reported
2024 & beyond	Not yet granted	Not yet reported

Actuarial standards of practice as well as the Government Accounting Standards require that the actuarial valuation reflect the best estimate of future experience. From 2011 through 2017, it is apparent that the actuarial estimate of future COLAs was accurate. Even in 2018 when the actuary assumed that there would only be one more COLA, the actuarial estimate proved strong for three more years. But it is hard to argue by 2020 that based on past experience, no COLAs will ever be granted other than the 2022 COLA.

As a result, we believe that the 2020 actuarial results were likely not reflecting the best estimate of future experience and are not consistent with actuarial standards of practice. Of course, if the HPRS Board never again grants a COLA, then the 2020 actuarial results are appropriately calculated.

Administrative Expense Load

Foster & Foster developed the administration expense assumption based on the prior two years of actual administrative expenses, adjusted for inflation. This is a reasonable approach.

POST-EMPLOYMENT HEALTHCARE ASSUMPTIONS

Gross Claim Rate Derivation

It is common practice for actuaries to project future claim costs by measuring past experience and adjusting it to reflect the effects of inflation and plan design. Foster & Foster did this based on the most recent 36-month Medical Mutual of Ohio and Express Scripts claims and enrollment experience as well as the Aetna Medicare Advantage premium rates. Foster & Foster documented this in the actuarial valuation report. Based on our review of the resulting health care rates for medical and prescription drug costs, dental and vision, we find that the health care claim cost assumptions are reasonable.

We have reviewed the resulting gross rates and find them reasonable. We recommend that Foster & Foster provide more detail in the determination of the age-based claims cost in the actuarial valuation report.

Health Care Cost Trend Rate

To properly measure future liabilities, actuaries apply trend rates (health inflation) to the base claim costs described above. Standard practice is to use prevailing national trend rates and grade down to an ultimate trend rate that is slightly higher than prevailing CPI rates. In this case, the ultimate trend rate is 4.75%. Foster & Foster used 7.70% for the Pre-Medicare Medical and Prescription Drug Plan and used 5.70% for the Medicare Advantage Plan initial rates. Foster & Foster did not fully disclose the basis of the health care cost trend rates; we recommend that Foster & Foster provide more detail and rationale for this very important actuarial assumption. We find that the trend rates used by Foster & Foster are reasonable.

COVID has had a profound effect on healthcare costs. We encourage Foster & Foster to consider this carefully in the next experience investigation. This might lead to projections based on long run trends, extrapolating from 2026 forward, leaving the intervening turbulence (years 2022 -2025) mostly unspecified.

Morbidity

In a health insurance valuation, morbidity is sometimes defined as the difference in claims costs at different ages. Morbidity rates are also known as aging factors and are used to transform average health cost assumptions to health care cost assumptions which vary by age and gender. Foster & Foster developed morbidity factors based on the methods detailed in a widely accepted study by the Society of Actuaries.

We encourage Foster & Foster to review these factors in the next experience study to the extent data is available. At the very least, we would recommend that the experience study report discloses the process used for choice of these aging factors. We reviewed the aging factors developed by Foster & Foster and found them appropriate.

Retiree Contributions

The true measure of a plan's liability is the difference between total claims costs and the amount that retirees contribute to offset those total costs. In developing the Plan's liability, Foster & Foster used the specific HPRS subsidy provisions. We reviewed the methodology used by Foster & Foster and found it appropriate. However, additional detail could be provided directly in the report as we found it necessary to reference the retiree benefit booklets provided on the HPRS website for clarification of the retiree contribution provisions. For clarity and transparency, we recommend that this information be included in the actuarial valuation report.

Health Plan Participation Rates and Elections

Based on the Foster & Foster experience investigation performed in 2020, Foster & Foster recommended a table of annual health care coverage election rates based on member ages. The analysis of the participation rates proved problematic in the experience investigation due to credibility concerns. We recommend that Foster & Foster demonstrate a rigorous analysis of these election rates for current retirees separate from future retirees in the next experience investigation.

DISCLOSURE OF ACTUARIAL ASSUMPTIONS AND METHODOLOGY

Foster & Foster's disclosure of actuarial assumptions (and methods) was adequate, particularly given the complexity of HPRS. We note in Section 4 recommendations for more detailed and robust disclosures of some assumptions, including rationale for the selection of these assumptions.

If HPRS were ever to change actuaries from Foster & Foster, based on our experience with the audit, the new actuary would be able to confirm the reasonableness of Foster & Foster's calculations.

Section 3 – Audit of Compilation of Actuarial Valuations

The cornerstone of an actuarial audit is a replication of the actuarial valuation. As mentioned above, we matched quite closely the costs and liabilities developed by Foster & Foster for the retirement system and retiree health benefits. Consequently, we conclude that the valuation calculation results are accurate. As noted above, however, we are concerned with the failure to recognize future COLAs or mortality improvement beyond 2025.

The following table summarizes the present value of future benefits, actuarial liability and normal cost for the Pension Benefits calculated by Foster & Foster and replicated by PTA/KMS actuarial valuations.

Table 3.1
Pension Benefits Liabilities as of December 31, 2020

Actuarial Liabilities and Normal Cost as of December 31, 2020 (\$ in thousands)			
	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Present Value of Future Benefits			
Active Members*	635,505	623,213	-1.93%
Vested Former Members	8,560	8,402	-1.85%
Rehired Retirees	0	0	0.00%
Retirees and Disableds	699,089	698,805	-0.04%
Beneficiaries and Survivors	40,891	41,754	2.11%
Contributions Refund Due	2,637	2,637	0.00%
Total	1,386,682	1,374,810	-0.86%
Accrued Liability			
Active Members	452,710	457,517	1.06%
Vested Former Members	8,560	8,402	-1.85%
Rehired Retirees	0	0	0.00%
Retirees and Disableds	699,089	698,805	-0.04%
Beneficiaries and Survivors	40,891	41,754	2.11%
Contributions Refund Due	2,637	2,637	0.00%
Total	1,203,887	1,209,114	0.43%
Normal Cost	21,606	21,638	0.15%

* Present Value of Future Benefits (PVFB) for Active Members not explicitly provided; PTA/KMS calculated as the active PVFB as the difference between the total PVFB provided in Foster & Foster report and liabilities attributed to inactive members.

The following table summarizes the actuarial liability and normal cost for the retiree health benefits calculated by Foster & Foster and replicated by PTA/KMS actuarial valuations.

**Table 3.2
Retiree Health Benefits Liabilities as of December 31, 2020**

Actuarial Liabilities and Normal Cost as of December 31, 2020 (\$ in thousands)			
	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Accrued Liability			
Active Members	122,895	126,287	2.76%
Inactive Members	162,433	161,393	-0.64%
Total	285,328	287,679	0.82%
Normal Cost	5,196	5,277	1.55%

**Table 3.3
Summary of Deviation of Replication Results**

	Pension Benefits Valuation Results	Retiree Health Valuation Results
Accrued Liability	0.43%	0.82%
Normal Cost	0.15%	1.55%

As mentioned above, this pertains only to the *replication* of F&F calculations, which are based on assumptions that no future COLAs will be granted and that mortality will not improve beyond 2025.

Actuaries generally use a 5% deviation as an acceptable range of error. As the total actuarial liabilities and normal costs deviations calculated by PTA/KMS were well within this “margin of error,” we are completely satisfied that the numbers are calculated accurately.

Although we did match quite closely, there are several areas which we would encourage Foster & Foster to explore further:

In valuing the pension and retiree health benefits, we uncovered a few items that could be corrected, but overall would be immaterial to the valuation results and have included them in Section 4.

HPRS provided us with the system data for all active members and pensioners. Foster & Foster also provided us with the data files they utilized in performing the valuations. Detailed data layouts that identified all the data elements used by Foster & Foster were not provided for the pension or health valuations. In performing our replication, we utilized the data files provided by Foster & Foster.

The following tables summarize the demographic statistics for the pension benefits and retiree health benefits valuations calculated by Foster & Foster and replicated by PTA/KMS actuarial valuations:

Table 3.4
Active Members as of December 31, 2020 (\$ in thousands)

TOTAL	Male			Female			Total		
	F&F	PTA/KMS	% Diff.	F&F	PTA/KMS	% Diff.	F&F	PTA/KMS	% Diff.
Number of Members	1,405	1,405	0.00%	137	137	0.00%	1,542	1,542	0.00%
Annual Salaries	107,938,462	107,938,461	0.00%	10,057,768	10,057,768	0.00%	117,996,230	117,996,230	0.00%
Average Annual Salary	76,825	76,825	0.00%	73,414	73,414	0.00%	76,522	76,522	0.00%
Average Age	39.3	39.3	0.00%	38.2	38.2	-0.05%	39.2	39.2	0.00%
Average Service	14.0	14.1	0.71%	12.4	12.6	1.94%	13.9	14.0	0.51%

Table 3.5
Inactive Members as of December 31, 2020

TOTAL	Male			Female			Total		
	F&F	PTA/KMS	% Diff.	F&F	PTA/KMS	% Diff.	F&F	PTA/KMS	% Diff.
Eligible for Allowances	21	21	0.00%	5	5	0.00%	26	26	0.00%
Eligible for Refunds Only	0	2	0.00%	0	1	0.00%	0	3	0.00%
Total	21	23	9.52%	5	6	20.00%	26	29	11.54%

Table 3.6
Retirees and Beneficiaries as of December 31, 2020 (\$ in thousands)

SERVICE RETIREES	Male			Female			Total		
	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Number of Members	1,243	1,243	0.00%	55	55	0.00%	1,298	1,298	0.00%
Annual Allowance	58,508,002	58,508,002	0.00%	2,409,255	2,409,255	0.00%	60,917,257	60,917,257	0.00%
Average Allowance	47,070	47,070	0.00%	43,805	43,805	0.00%	46,932	46,932	0.00%
Average Age	68.0	68.0	0.00%	57.3	57.3	0.00%	67.5	67.5	0.00%

SURVIVORS & BENES	Male			Female			Total		
	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Number of Members	9	9	0.00%	274	274	0.00%	283	283	0.00%
Annual Allowance	28,851	28,851	0.00%	5,167,596	5,167,596	0.00%	5,196,447	5,196,447	0.00%
Average Allowance	3,206	3,206	0.00%	18,860	18,860	0.00%	18,362	18,362	0.00%
Average Age	29.5	29.5	0.00%	74.1	74.1	0.00%	72.7	72.7	0.00%

DISABILITY RETIREES	Male			Female			Total		
	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Number of Members	127	127	0.00%	22	22	0.00%	149	149	0.00%
Annual Allowance	4,645,183	4,645,184	0.00%	795,905	795,905	0.00%	5,441,088	5,441,088	0.00%
Average Allowance	36,576	36,576	0.00%	36,178	36,177	0.00%	36,517	36,517	0.00%
Average Age	56.9	56.9	0.00%	52.3	52.3	0.00%	56.2	56.2	0.00%

TOTAL	Male			Female			Total		
	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Number of Members	1,379	1,379	0.00%	351	351	0.00%	1,730	1,730	0.00%
Annual Allowance	63,182,036	63,182,037	0.00%	8,372,756	8,372,755	0.00%	71,554,792	71,554,792	0.00%
Average Allowance	45,817	45,817	0.00%	23,854	23,854	0.00%	41,361	41,361	0.00%
Average Age	66.7	66.7	0.00%	70.1	70.1	0.00%	67.4	67.4	0.00%

Table 3.7

Members in Retiree Health Care Benefits Valuation as of December 31, 2020			
Status	Number		
	<u>F&F</u>	<u>PTA/KMS</u>	<u>% Diff.</u>
Active Members	1,542	1,542	0.00%
Retirees and Surviving Spouses Currently Receiving Benefits	1,486	1,486	0.00%
Retirees and Surviving Spouses not currently receiving benefits	244	244	0.00%
Inactives not currently receiving benefits	9	9	0.00%
Grand Total	3,281	3,281	0.00%

Section 4 – Other Considerations

ACTUARIAL REPORT

We found the Foster & Foster actuarial valuation reports and experience study report to be well written and focusing on important issues. Actuarial Standard of Practice (ASOP) No. 41 provides extensive guidance to actuaries regarding actuarial communications. We find that the Foster & Foster reports fully comply with the guidance of ASOP 41.

We would recommend a few modifications to enhance the completeness of the actuarial valuation reports and experience investigation and we have included these recommendations below under “RECOMMENDATIONS”.

Additionally, the reports generally are consistent with Government Finance Officers’ guidelines for reporting. The Foster & Foster signers of the reports are qualified actuaries and compliant for their continuing professional development education as of 2021.

The actuarial experience study and report were similarly comprehensive, complete, and clear.

ACTUARIAL AUDIT PROCESS

Foster & Foster provided only a limited amount of information for individual test lives supporting the calculations. The inactive test lives only provided results for the present value of future benefits and first year expected benefit payments without any further detail. The active pension and OPEB test lives had slightly more detail as the present value of future benefits, future service and salary, accrued liability, and normal cost, but lacked details for individual benefits. While the projections of the present value of future service and salary were helpful in ensuring the decrements were being applied correctly at each age, the only other information provided for actives in the sample lives was the overall present value of future benefits, accrued liability, and normal cost. There was no information by specific benefit or decrement. This means that rather than reviewing the actuaries work, the auditing actuary must try to replicate the number without any specific information other than written descriptions in the report and statute. As a consequence of this lack of information, (1) we cannot confirm that Foster & Foster is properly making the calculations, only that our calculations match within a reasonable margin, and (2) the audit process is much more tedious, time-consuming and drawn out than necessary.

We understand that there may be sound business, competitive, or legal reasons for Foster & Foster to have a non-disclosure policy. We also understand that at some other major actuarial firms (particularly those which do not consult to public pensions) have a similar policy. However, it is important to point out that this policy can make actuarial audits more problematic, lengthy and dubious than normal, as indicated in the previous paragraph. It would probably be helpful if future

auditors were aware of the limits on shared information in advance. This issue is not unique to HPRS and Foster & Foster. Actuarial firms are more often taking this approach of limiting detailed information that is shared. While most of the more than 20 audits that we have conducted in the last 20 years have not had this issue, many of the ones we have conducted in the last five years do have this issue.

RECOMMENDATIONS

- A. In valuing the pension and retiree health benefits, we uncovered a few items that could be corrected, but overall would be immaterial to the valuation results:
1. Provide payment form information for all retired members in the database. Most option codes are blank.
 2. Include historical salaries from pension data in OPEB data for Entry Age Normal calculations.
 3. Include DROP duration information in the OPEB data.
 4. Add further clarifying language to the report regarding the percentage of members assumed to enter DROP at each age. Based on the information provided in the report, we assumed that the percentage of members entering DROP at each unreduced retirement age was equal to the difference between 85% and the retirement rates provided since the report states that 15% of members do not enter DROP or retire once unreduced retirement eligibility is reached. The sample calculations provided supported this, however, the report could clarify this assumption better.
 5. Clarify when members who enter DROP start receiving benefits under OPEB. The only information provided is that there is an assumed DROP duration of 5 years, therefore, we assumed that those members assumed to enter DROP would begin receiving coverage after 5 years. For members currently in DROP, we assumed that they would begin receiving coverage 5 years after the date they entered DROP or the valuation date, if later, but again, this was not clear from the assumptions in the report.
 6. For OPEB, ensure that all relevant information is provided in the actual OPEB database. We believe that the DROP entry date for those members currently in DROP is needed for the OPEB valuation, but we had to obtain this information from the pension database.
 7. Provide rationale for annual health care coverage election rates and how they are used, including what rates to use for survivors of deceased retirees. One test life of a married pensioner applied the Annual Spouse Coverage Rate to the total medical

benefits (retiree and spouse) where we would have applied the Annual Member Election Rate to the pensioner medical benefit and the Spouse Coverage Rate to the spousal portion of the medical benefit.

8. The health care rates disclosed on page 13 of the retiree health benefit report describes these rates as "...representative of the Plan's portion of the total care cost:", however, the test lives show these amounts as "Cost" but offset these amounts by "Con" for a net "EmplrCost". Like the dental and vision benefits shown on page 14, we assumed that the health care rates were the full cost of coverage.

B. We recommend that Foster & Foster includes the following in the pension benefits and retiree health benefits valuation reports and experience study:

1. Rationale for economic and demographic assumptions under the guidance of ASOP 27 and ASOP 35, respectively.
2. Rationale for pension COLA assumption.
3. Rationale for mortality projection basis.
4. Include COLA analysis in next experience study.
5. Provide a more robust analysis of risk measurements under the guidance of ASOP 51.
6. Explicitly state form of benefit for disabled members in pension report.
7. Explicitly state the DROP crediting rate assumption in pension report.
8. Add assumption for percent married to retiree health benefits report.
9. Explicitly state coverage provided to retirees and dependents in retiree health benefits report.
10. Disclose covered spouse mortality in retiree health benefits reports and contingent annuitant mortality in pension report.
11. Provide greater detail on the development of the Per Capita Claims Costs and Contribution Amounts in retiree health benefits report.
12. Disclose more robust rationale for the health care cost trend rates.

13. Disclose percentage of disabilities assumed to be service-incurred in retiree health benefits report.

CONCLUSIONS

We found Foster & Foster's calculations to be accurate. We do not believe that any methods, or calculations are erroneous to the level of necessary recalculations.

We find that the assumption of no future COLA particularly problematic, as well as the assumption that mortality will not improve beyond 2025. Changes to more realistic assumptions would extend the funding period beyond 30 years.

Foster & Foster, the ORSC, and the HPRS staff were fully cooperative and responsive, which assisted in the process.