

Actuarial Valuation & Levy Adequacy Analysis

FPDR

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JANUARY 22, 2019

Introduction

- Milliman has completed its June 30, 2018 actuarial valuation of the FPDR program
 - Actuarial valuations are performed biennially
- We have also completed an analysis assessing the likelihood that the permitted levy under the City Charter will be adequate to fund the FPDR program, including contributions to Oregon PERS for FPDR Three members
 - The analysis can be used by interested parties to assess the magnitude and potential volatility of future FPDR levies and to quantify several likely sources of levy volatility

Basis of Valuation and Levy Modeling

- The previous iterations of valuation and levy modeling were performed as of June 30, 2016
- There have not been any significant changes in projected benefits valued since the previous work
 - This is in contrast to the June 30, 2016 results, which first reflected changes in FPDR Two COLA policy, arbitrator rulings regarding 27 pay period calculation, and additional assumed pay increases due to new Police contract
- Assumption changes since June 30, 2016:
 - Discount rate update in accordance with previously adopted assumption (affects valuation, but not levy modeling)
 - Mortality update in accordance with previously adopted assumption
 - Updated Real Market Value (RMV) for property subject to taxation (affects levy modeling, not valuation)

Actuarial Valuation Results

Valuation – Uses & Limitations

- The actuarial valuation will provide the basis for two fiscal years of financial statement reporting information for both FPDR and the City of Portland
- Results as of June 30, 2018 will be rolled forward for use in financial reporting at June 30, 2019 and June 30, 2020
- The pay-as-you-go structure of FPDR benefits means that the valuation is not used for:
 - Establishing the funded status of the FPDR program
 - Determining an actuarially calculated pre-funding contribution rate

Projected Pension Benefit Payments

- An actuarial valuation is a very long-term calculation model
 - In total, as of June 30, 2018 retired and disabled FPDR members and their beneficiaries were receiving retirement pensions and long-term disability income replacement payments of approximately \$10 to \$11 million per month
 - In our valuation model, those payments are forecast to increase for the next 19 years on a non-inflation adjusted basis
 - The subsequent decline is gradual, with payments not receding to current levels (in non-inflation adjusted dollars) until around the year 2058
- Given the very long-term nature of the modeling, assumptions play a key role in the calculations

2018 Valuation Assumptions

Discussed with FPDR Board subcommittee in November 2018

- This valuation generally reflects the same assumptions used in the June 30, 2016 actuarial valuation
 - Based on the 2014 actuarial experience study, presented in May 2014
- Certain assumptions were updated for June 30, 2018
 - Discount rate: assumption is defined by reference to municipal bond index rate; valuation uses market rate as of the valuation date
 - Mortality: In 2014 Board approved use of Oregon PERS police & fire mortality assumption; FPDR assumption updated to maintain that link
- Reviewed the assumption for 27 pay period adjustments
 - 2016 valuation used load of 2.5% of Final Pay to estimate the effect; roughly equal to 65% of members retiring at a 27 pay period date
 - Data through end of FYE 2018 was consistent with this assumption, so no change was made

2018 Valuation Assumptions

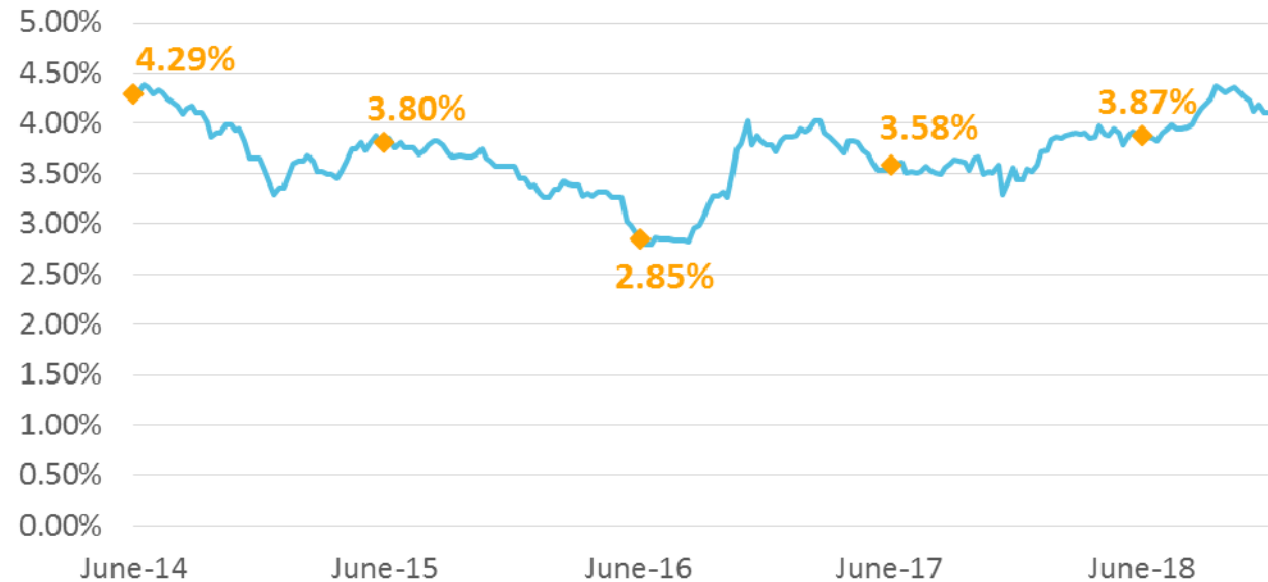
- Discount rate

- Based on Bond Buyer Index shown at right
- 6/30/2018 rate of 3.87% is significantly higher than the previous valuation date of 6/30/2016
- Rates have increased further since then

- Mortality:

- Updated to current Police & Fire assumption used by Oregon PERS
- PERS adopted new mortality tables in July 2017 after a study of Oregon public safety mortality experience
- Adopting the new mortality assumption lowered liabilities modestly

Bond Buyer 20 Municipal Bond Index



Benefit Provisions Valued

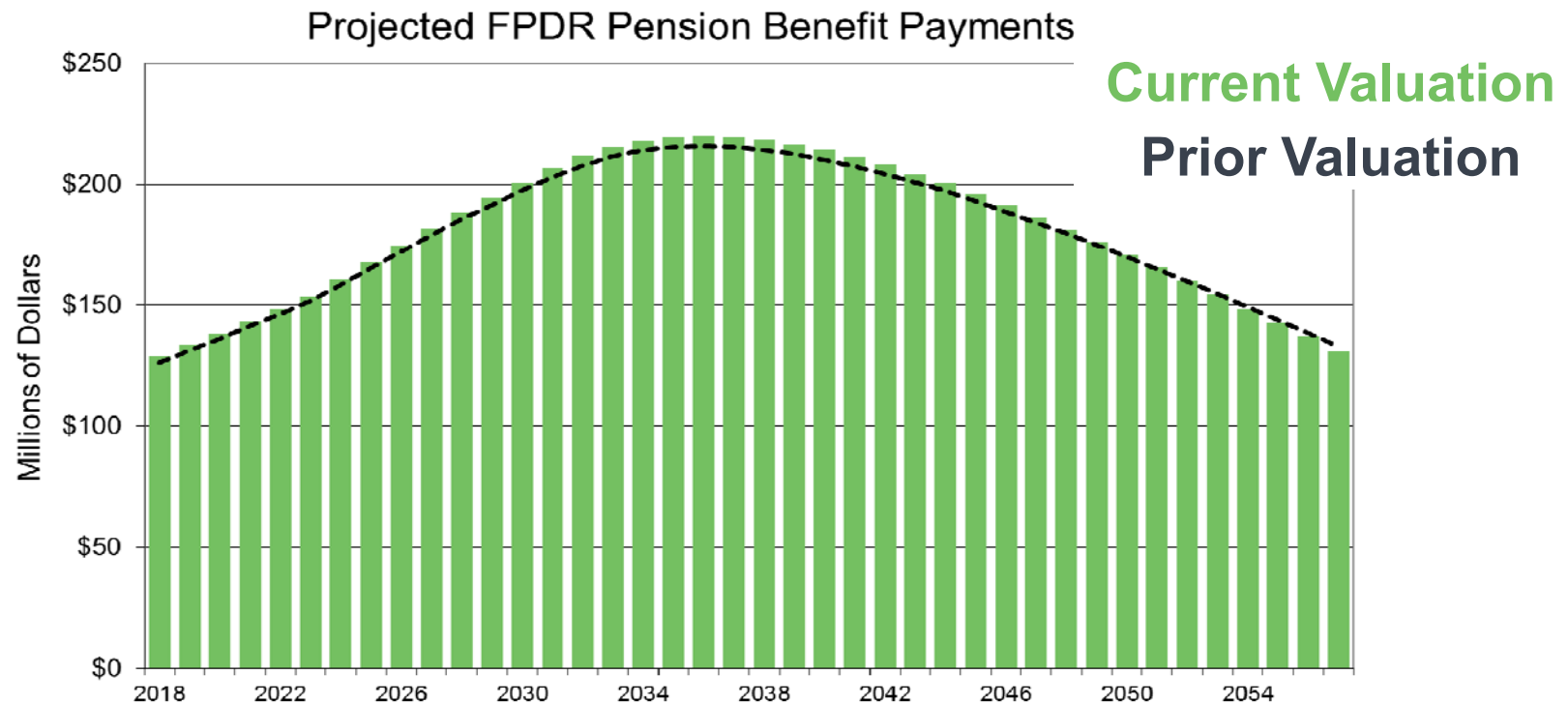
- As discussed, there were no significant changes in benefit provisions compared to the prior valuation
- Prior to June 30, 2016, COLA provisions relevant to FPDR Two changed several times
- Both June 30, 2016 and June 30, 2018 valuations use “modified PERS” COLA
 - CPI-U changes up to 2.00% for service prior to October 8, 2013, and 1.25% for service after October 8, 2013

Actuarial Valuation - Development of Liabilities

- A valuation calculates projected FPDR benefit payments by year for the FPDR membership group as of the valuation date
 - The projections combine the member and beneficiary census data with all of the long-term actuarial assumptions
- Those projected payments are then converted into a net present value as of the valuation date using a discount rate assumption that reflects the time value of money
- A *cost allocation method* attributes a portion of the net present value for current actives to their service already rendered
 - This is called the ***actuarial accrued liability*** for the actives
- The portion of the net present value attributed to the upcoming year is called the ***normal cost*** for active members

Actuarial Valuation – Projected Benefits

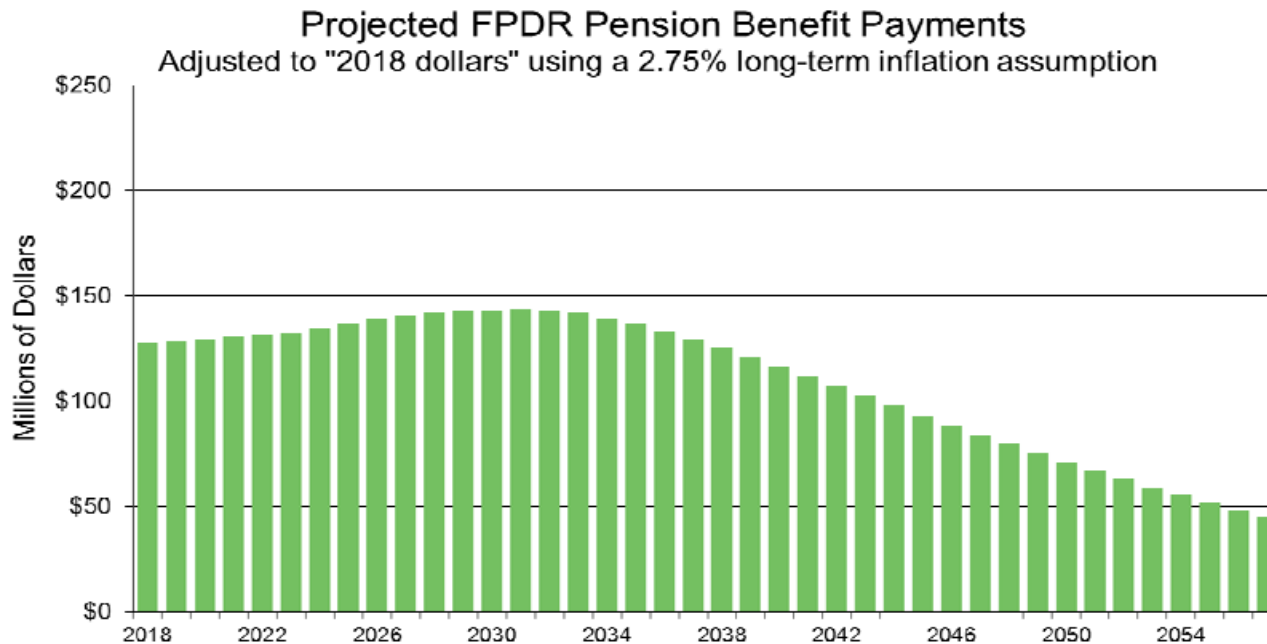
- Below are projected FPDR pension benefit payments on a non-inflation adjusted basis for the two most recent valuations



- Benefits projected to increase for 18 years; decrease thereafter
- Projected benefit payment are very similar to prior valuation

Actuarial Valuation – Projected Benefits

- This chart shows this valuation's projected payments on an inflation-adjusted basis using a long-term inflation assumption



- Once almost all FPDR Two members have retired, benefits will then begin to decrease over time when measured on this inflation-adjusted basis

Actuarial Valuation Results

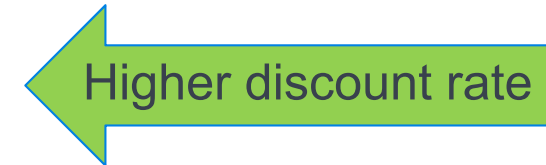
(\$ in millions)	6/30/2016 Valuation	6/30/2018 Valuation
Discount Rate	2.85%	3.87%
Cost Allocation Method	Entry Age Normal	Entry Age Normal
Actuarial Accrued Liability	\$3,690.0	\$3,323.7
Normal Cost	\$88.6	\$64.4
Projected Base Pay for Next Year	\$138.0	\$152.2

- A 3.87% discount rate was used for this valuation
 - Same assumption used for June 30, 2018 financial reporting
 - Reflects 20-year municipal bond index, per GASB financial reporting standards
 - Much higher than value of this index at previous valuation, which materially decreases Actuarial Accrued Liability (as detailed on the next slide) and Normal Cost

Actuarial Valuation Results

Actuarial Accrued Liability Changes

(\$ in millions)	Actuarial Accrued Liability
6/30/2016 Actuarial Accrued Liability	\$3,690.0
Expected increase	148.6
Assumption change – Discount rate	(553.8)
Assumption change – Mortality	(35.3)
Assumption change – Disability medical	4.9
Experience (gain)/loss	69.3
6/30/2018 Actuarial Accrued Liability	\$3,323.7



- The largest component of the experience gain/loss was a loss due to recent salary growth above the long-term assumption
- More details can be found in our formal actuarial valuation report

Levy Adequacy Modeling

Levy Analysis

Total Requirements Calculation

- Our model includes separate components to develop the ***Total Requirements*** for FPDR
 - ***Pay-as-you go costs subcomponent***
 - FPDR One and FPDR Two retiree payments, including death, disability and disability-related medical
 - FPDR Three death, disability and disability-related medical
 - Administrative and operating expenses for the program
 - ***Pre-funded costs subcomponent*** (charged on FPDR Three payroll)
 - Variable contributions to the Oregon PERS (PERS) defined benefit program, in which FPDR Three members are eligible for OPSRP benefits
 - Set by the PERS Board, and includes a charge for the value of benefits currently being earned and a shortfall amortization charge for PERS unfunded liability
 - Fixed 9% of payroll contribution to the account balance-based Individual Account Program (IAP) administered by PERS

Effect of Transition to FPDR Three

- During the projection period of our levy adequacy analysis, the FPDR levy will be funding two generations of FPDR members simultaneously
 - FPDR One and FPDR Two members funded on a pay-as-you-go basis during their retirement years
 - Pre-funding of FPDR Three members' retirement benefits during their working careers
- In addition, disability and administrative costs are funded on a pay-as-you-go basis
- Higher levies and near-term costs are expected during a transition from a pay-as-you-go system to a pre-funded system

Effects of 2006 City Charter Reform

- Ultimately, the long-term cost of any benefit program is:

$$\text{Cost} = \text{Benefits Paid} + \text{Administrative Expenses} - \text{Investment Earnings}$$

- Effects of the 2006 City Charter reform on long-term cost are:
 - Establishment of decreased benefit levels for FPDR Three
 - The pre-funded nature of FPDR Three benefits creates the potential for investment earnings, which lower long-term cost
- The cost-saving effects of the 2006 reform accrue very slowly, with the most dramatic impact likely to occur more than 20 years out, after nearly all FPDR Two retirees have commenced their pay-as-you-go benefits

Variability in Levy Adequacy Model Analysis

- A levy adequacy analysis is not a guarantee of what will occur, and our model accordingly attempts to illustrate the potential variability of outcomes
- In our model, the two large factors that drive levy variability are actual:
 - Changes in Real Market Value (RMV) that deviate from the baseline forecast
 - Oregon PERS investment experience varying from baseline forecast
 - Variability due to this factor increases over time as a greater percentage of total payroll becomes FPDR Three
- In many of the poor economic scenarios modeled, low RMV growth and poor PERS investment results are linked, leading to a leveraged upward effect on the levy rate calculated as a fraction of RMV

Basis for the Levy Adequacy Model

- June 30, 2018 FPDR member demographic census
- Benefit provisions as reflected in the June 30, 2018 valuation
- RMV provided by the City of \$149.7 billion as of January 2018, which was used in the 2018 levy request to fund FPDR for the 2018-2019 fiscal year (also known as fiscal 2019)
- RMV growth from 2018 to 2019 of 5.0% and median annual growth in subsequent years of 4.5%, based on input from the City of Portland's economist
 - A wide variety of potential RMV growth patterns were modeled
- A financial model with varying investment returns projecting Oregon PERS contributions using the most recent valuation and estimated 2018 PERS investment returns of -5%

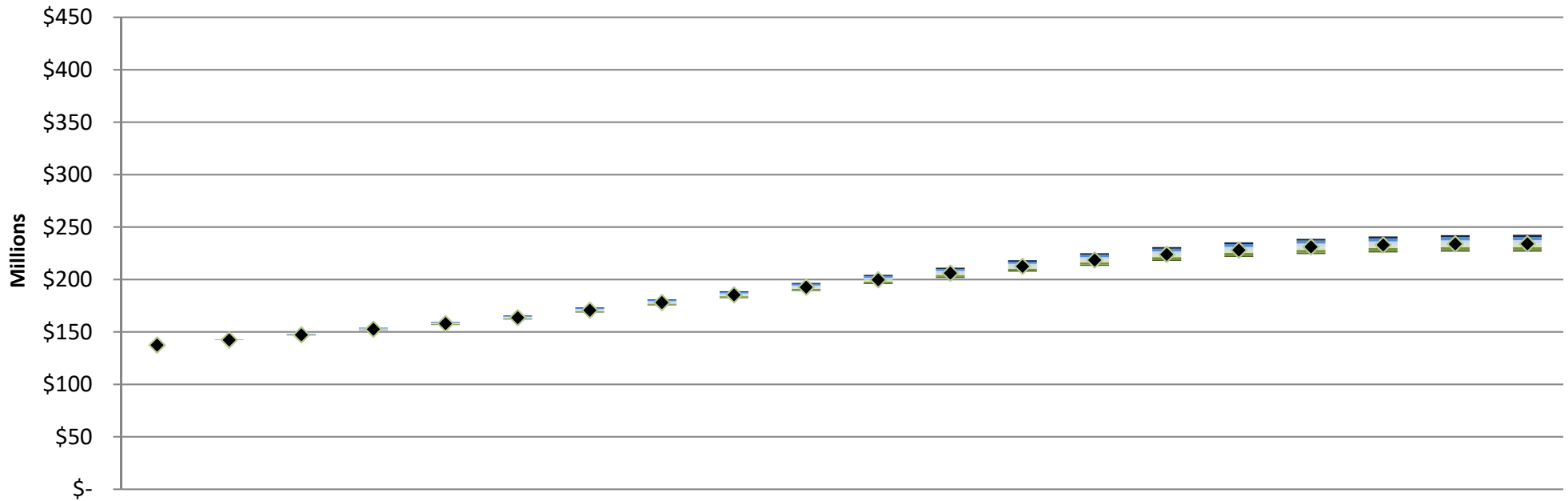
Interpreting Analysis Results

- Results are shown as a probability distribution, rather than a single amount
 - The distribution is based on a stochastic simulation using 10,000 economic scenarios
 - Scenarios were developed by Milliman's national team of credentialed investment professionals that specializes in capital market models
- In the charts, the dots represent median outcomes
- We graphically display results from the 5th to 95th percentiles, so ten percent of model outcomes fall outside of the depicted range

Total Requirements

Pay-As-You-Go Costs Subcomponent

- Relatively predictable; increasing until essentially all FPDR Two actives are retired; FPDR Three disability and inflation-linked values of future FPDR Two benefits add volatility in later years



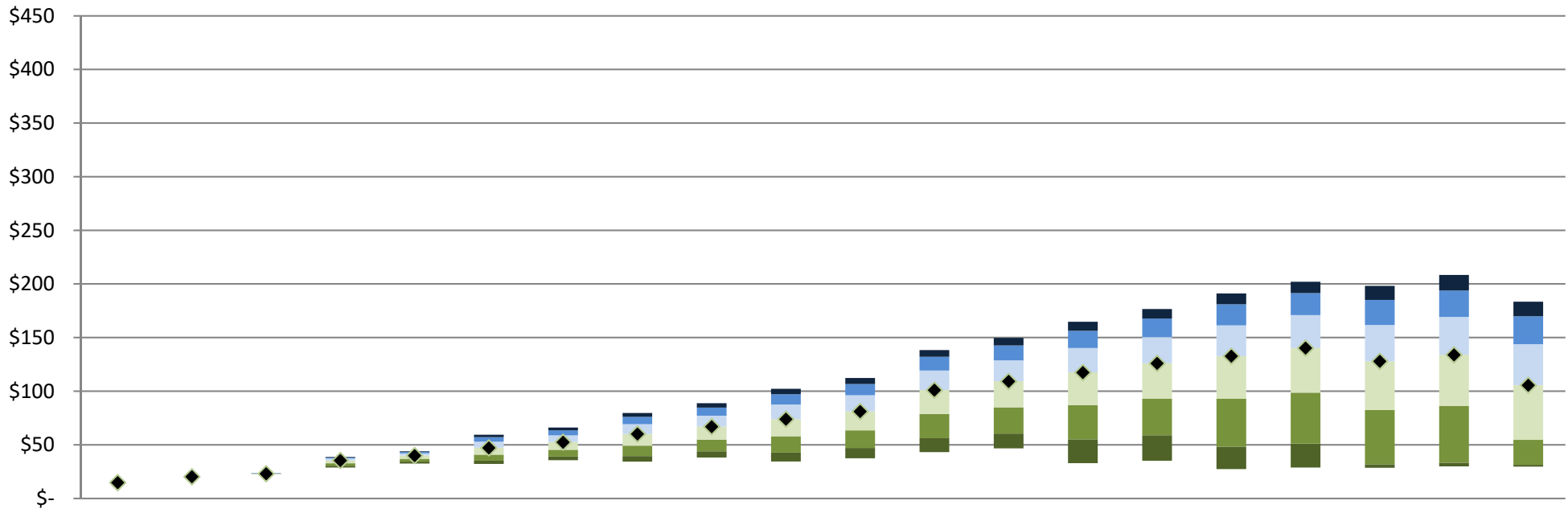
Includes administrative & operating expenses and short-term disability and medical costs

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Total Requirements

Pre-Funded Costs Subcomponent

- Increases as the portion of payroll that is FPDR Three grows; more variable than pay-as-you-go costs since OPSRP contribution rates are linked to variable OPERS investment results



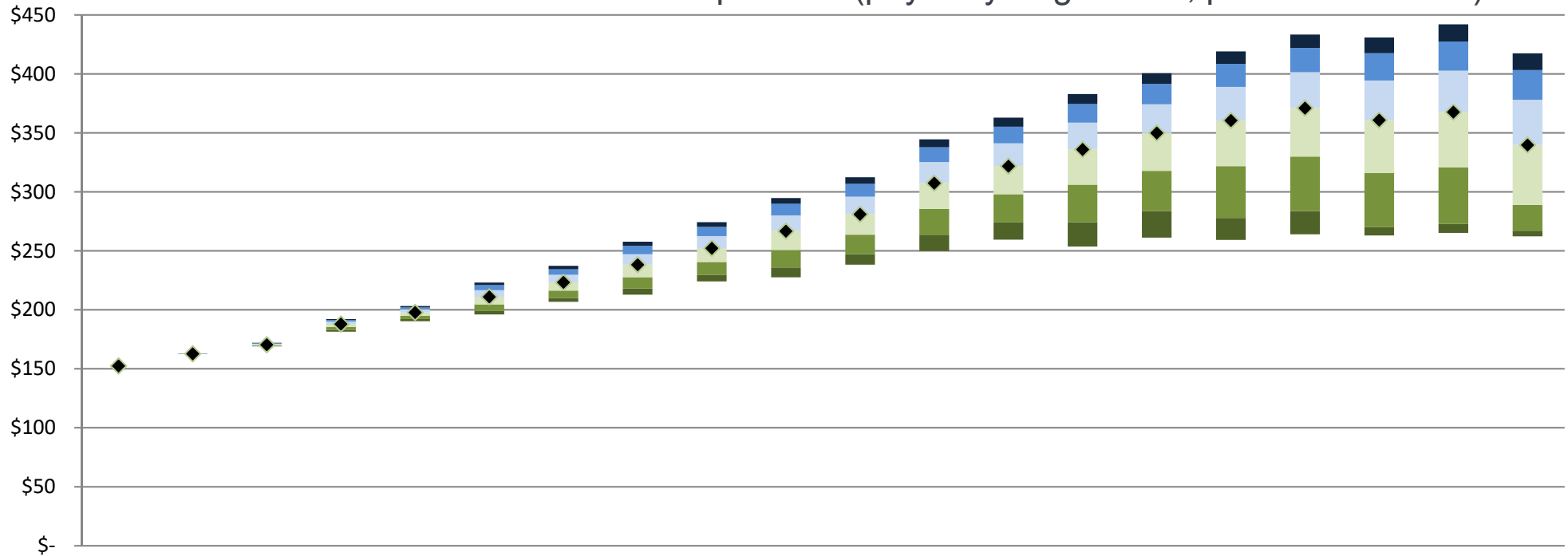
FY Ending 6/30	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
5th	14.9	20.4	23.8	38.6	44.0	59.5	66.2	79.8	88.9	102.3	112.4	138.4	149.8	164.8	176.6	191.1	202.1	198.3	208.5	183.5
10th	14.9	20.4	23.7	38.1	43.4	57.2	63.5	76.1	84.8	97.2	106.7	132.1	142.7	156.4	167.8	181.1	191.5	185.2	193.9	170.0
25th	14.9	20.4	23.4	37.2	42.1	53.0	58.9	69.3	77.2	87.6	96.3	119.4	128.8	140.3	150.5	161.5	171.0	161.8	169.3	143.9
50th	14.9	20.4	23.1	35.5	40.1	47.3	52.6	60.2	67.1	74.0	81.2	101.2	109.3	117.6	126.1	132.8	140.3	128.0	134.0	105.7
75th	14.9	20.4	22.9	32.8	37.0	40.9	45.4	49.3	54.8	57.9	63.6	78.7	85.0	87.0	93.1	93.2	98.7	82.6	86.2	54.6
90th	14.9	20.4	22.6	30.6	34.4	35.2	39.1	39.5	44.0	42.8	47.0	56.2	60.6	55.2	59.0	48.3	51.2	31.9	33.3	31.3
95th	14.9	20.4	22.5	28.9	32.6	32.2	35.7	34.3	38.2	34.5	37.5	43.3	46.7	33.0	35.2	27.4	28.8	28.6	30.0	29.7

Excludes administrative & operating expenses and short-term disability and medical costs

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Total Requirements

- This is the combination of the two subcomponents (pay-as-you-go costs; pre-funded costs)



FY Ending 6/30	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
5th	152.5	162.9	172.1	192.3	203.3	223.2	237.3	257.8	274.4	294.8	312.5	344.6	363.0	383.0	400.6	419.2	433.4	431.0	442.1	417.5
10th	152.5	162.9	171.8	191.5	202.1	221.0	234.5	254.2	270.3	289.9	306.9	337.9	355.3	374.5	391.5	408.6	422.1	417.7	427.4	403.4
25th	152.5	162.9	171.2	190.1	200.3	216.7	229.8	247.2	262.6	280.0	296.0	325.3	341.2	358.7	374.4	389.1	401.5	394.5	402.8	378.1
50th	152.5	162.9	170.6	188.1	197.9	211.1	223.4	238.4	252.4	266.9	281.1	307.5	322.0	336.1	350.1	360.6	371.2	360.9	367.9	339.9
75th	152.5	162.8	170.0	185.5	195.0	204.7	216.3	227.7	240.6	250.7	263.7	285.6	298.1	306.1	317.8	321.8	329.9	316.1	320.8	289.0
90th	152.5	162.8	169.4	183.2	192.2	199.1	210.1	218.1	229.8	236.0	247.2	263.3	274.2	274.4	283.6	278.0	283.8	270.3	272.9	267.2
95th	152.5	162.8	169.1	181.5	190.4	196.1	206.8	212.9	224.1	227.6	238.3	249.9	259.5	253.6	261.3	259.3	264.1	263.1	265.3	262.3

Includes administrative & operating expenses and short-term disability and medical costs

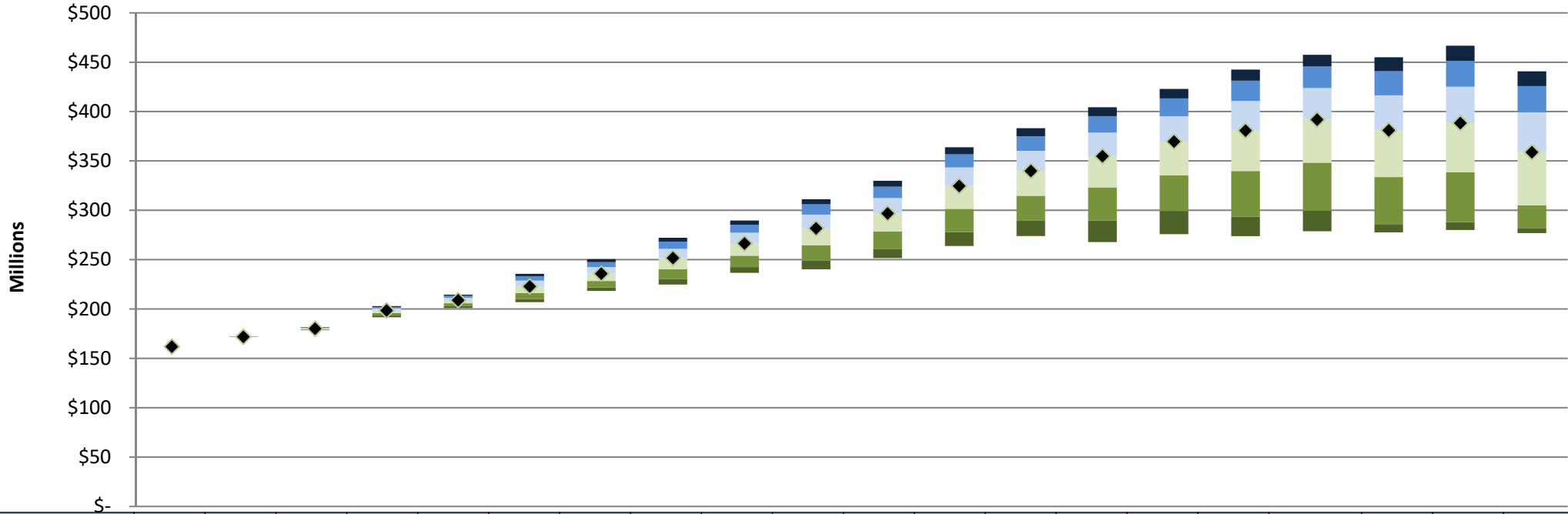
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Development of Final Levy in Dollars

- The Total Requirements shown on the prior slides are the estimate of the funds needed for the operation of FPDR, including PERS contributions for FPDR Three members
- Several adjustments are made to the Total Requirements amount to develop a ***Final Levy*** for Board and Council review
 - Decrease to account for other revenue sources
 - Increase to reflect the effects of discounts and delinquencies
 - Increase to reflect the effects of tax compression on some properties
- Based on communications with the City Economist and FPDR, the net effects of these three adjustments for years after fiscal 2018-2019 is estimated as a 6% increase
 - Details are in the Appendix

Final Levy in Dollars

- This shows the estimated Final Levy request as a dollar amount



FY Ending 6/30	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
5th	161.9	172.0	181.7	203.0	214.6	235.7	250.6	272.2	289.7	311.3	329.9	363.8	383.2	404.4	423.0	442.6	457.6	455.0	466.7	440.8
10th	161.9	172.0	181.4	202.1	213.4	233.3	247.6	268.4	285.4	306.1	324.0	356.8	375.1	395.4	413.4	431.4	445.7	441.0	451.3	425.9
25th	161.9	171.9	180.8	200.7	211.5	228.8	242.6	261.0	277.3	295.7	312.5	343.5	360.2	378.7	395.3	410.8	423.9	416.5	425.3	399.2
50th	161.9	171.9	180.1	198.6	208.9	222.9	235.9	251.7	266.4	281.7	296.8	324.7	339.9	354.9	369.6	380.7	391.9	381.1	388.4	358.9
75th	161.9	171.9	179.5	195.8	205.8	216.1	228.4	240.4	254.0	264.7	278.4	301.5	314.7	323.2	335.6	339.8	348.3	333.8	338.7	305.1
90th	161.9	171.9	178.9	193.4	203.0	210.2	221.8	230.3	242.6	249.2	261.0	278.0	289.5	289.7	299.5	293.5	299.6	285.4	288.1	282.1
95th	161.9	171.9	178.6	191.7	201.0	207.1	218.4	224.8	236.6	240.3	251.6	263.9	274.0	267.8	275.9	273.8	278.9	277.8	280.1	276.9

Includes administrative & operating expenses and short-term disability and medical costs

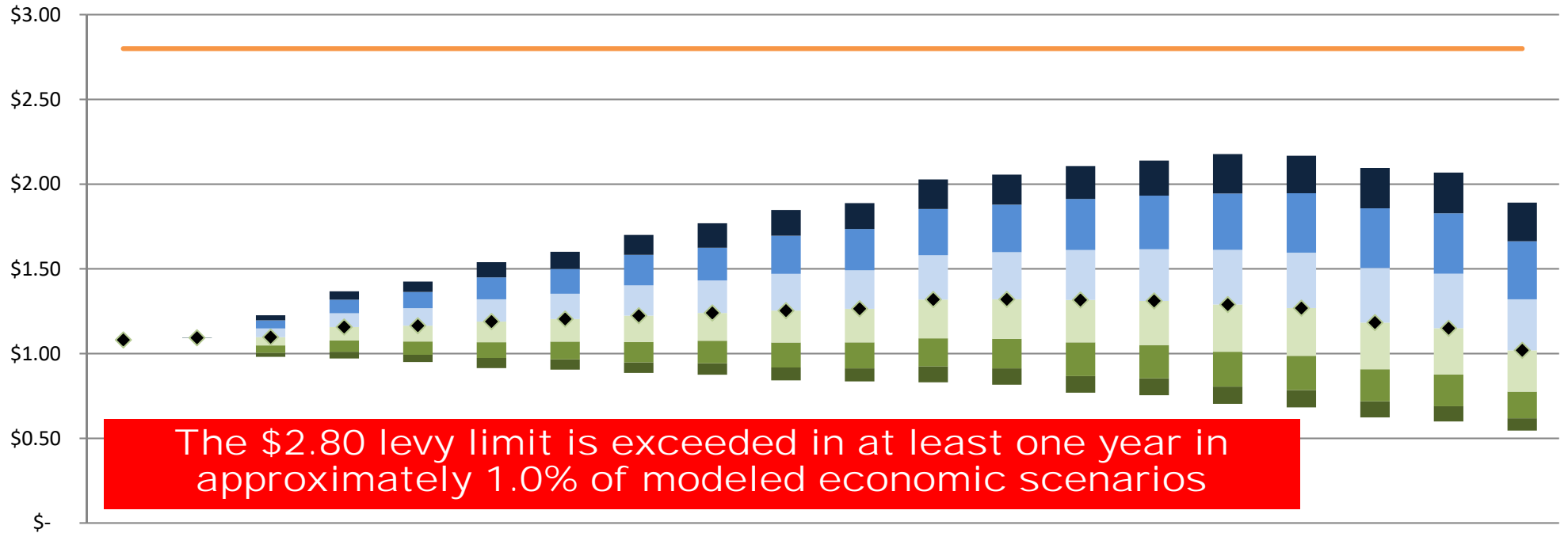
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Development of Final Levy as a RMV Rate

- The Final Levy in dollars shown on the prior slide is converted into a Final Levy as a RMV Rate
- That rate is then compared to the limit in the City Charter of \$2.80 per \$1,000 of RMV
- Future RMV levels vary significantly by scenario in the model
- In the two years since prior modeling, RMV grew 24%
 - RMV growth far exceeded the prior model's median assumed growth
- RMV growth also outpaced median growth in the final levy in dollars from the factors discussed on prior slides
 - Because of this, both the median levy rate and the likelihood the \$2.80 levy cap will come into effect are lower than in the prior modeling

Final Levy as a RMV Rate

- This shows the estimated Final Levy request as a rate per \$1,000 of RMV; the City Charter limits the levy to \$2.80



FY Ending 6/30	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
5th	1.08	1.09	1.23	1.37	1.43	1.54	1.60	1.70	1.77	1.85	1.89	2.03	2.06	2.11	2.14	2.18	2.17	2.10	2.07	1.89
10th	1.08	1.09	1.20	1.32	1.36	1.45	1.50	1.58	1.62	1.70	1.74	1.85	1.88	1.91	1.93	1.94	1.95	1.86	1.83	1.66
25th	1.08	1.09	1.15	1.24	1.27	1.32	1.35	1.40	1.43	1.47	1.49	1.58	1.60	1.61	1.62	1.61	1.60	1.51	1.47	1.32
50th	1.08	1.09	1.10	1.16	1.17	1.19	1.20	1.22	1.24	1.25	1.26	1.32	1.32	1.32	1.31	1.29	1.27	1.18	1.15	1.02
75th	1.08	1.09	1.05	1.08	1.07	1.07	1.07	1.07	1.08	1.07	1.07	1.09	1.09	1.07	1.05	1.01	0.99	0.91	0.88	0.78
90th	1.08	1.09	1.00	1.01	0.99	0.97	0.97	0.95	0.94	0.92	0.91	0.92	0.91	0.87	0.85	0.81	0.79	0.72	0.69	0.62
95th	1.08	1.09	0.98	0.97	0.95	0.91	0.91	0.89	0.88	0.84	0.84	0.83	0.82	0.77	0.75	0.70	0.68	0.62	0.60	0.55

Includes administrative & operating expenses and short-term disability and medical costs

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Other Sources of Levy Volatility

- The levy adequacy analysis model depicts volatility associated with RMV changes and Oregon PERS investment returns, but does not include all potential sources of volatility
- Other potential sources of volatility not modeled include
 - Potential correlated effects of market conditions on levels of tax compression and/or levels of tax delinquency
 - Effects of Oregon property tax law changes and/or new levies
 - Demographic experience different from assumption (e.g. retirement, retiree life expectancy, FPDR Two member salary)
 - Growth in FPDR workforce or change in workforce composition
 - Changes to Oregon PERS assumptions and methodology for setting employer contribution rates

Certification

This presentation summarizes key results of an actuarial valuation as of June 30, 2018 and stochastic levy adequacy analysis for the fiscal years 2019 to 2038 of the Fire & Police Disability & Retirement Fund (“FPDR” or “the Fund”) sponsored by the City of Portland. For complete actuarial valuation results, including cautions regarding the limitations of use of valuation calculations, please refer to our formal Actuarial Valuation Report as of June 30, 2018 (“the Valuation Report”) published in January 2019. The Valuation Report, including all supporting information regarding data, assumptions, methods and provisions, is incorporated by reference into this presentation.

In preparing this presentation, we relied, without audit, on information (some oral and some in writing) supplied by Fund and City of Portland staff. This information includes, but is not limited to, Fund benefit provisions as defined by City Charter, employee data, and financial information. We found this information to be reasonably consistent and comparable with information used for other purposes. The valuation results depend on the integrity of this information. If any of this information is inaccurate or incomplete our results may be different and our calculations may need to be revised.

All costs, liabilities, rates of interest, and other factors for the Fund have been determined on the basis of actuarial assumptions and methods which are individually reasonable (taking into account the experience of the Fund and reasonable expectations); and which, in combination, offer our best estimate of anticipated experience affecting the Fund.

A valuation report is only an estimate of the Fund’s financial condition as of a single date. It can neither predict the Fund’s future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of Fund benefits, only the timing of Fund contributions or cost recognition. While the valuation is based on an array of individually reasonable assumptions, other assumption sets may also be reasonable and valuation results based on those assumptions would be different. Likewise an actuarial projection, even if stochastic, is still determined by underlying assumptions. If different assumptions are used projection results may differ significantly. No one set of assumptions is uniquely correct.

Future actuarial measurements may differ significantly from the current measurements summarized in this presentation due to such factors as the following: Fund experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements; and changes in Fund benefit provisions or applicable law.

Certification

Future actuarial measurements may differ significantly from the current measurements summarized in this presentation due to such factors as the following: Fund experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements; and changes in Fund benefit provisions or applicable law.

This presentation includes identification and analysis of various risks relevant to the operation and funding of the FPDR program. Some of these risks were illustrated quantitatively through stochastic modeling, while others were identified without numerical illustration in this document. Our analysis was performed based on the methods, assumptions, and inputs described in this document. We recommend that FPDR continues to periodically perform further risk assessments in the future to take into account changing conditions in the underlying basis.

Milliman's work is prepared solely for the internal business use of the City of Portland and FPDR.

Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product. No third party recipient of Milliman's work product should rely upon it. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

The consultants who worked on this assignment are pension actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein.

Appendix

Appendix

Actuarial Basis

Data

We have based our calculation of the liabilities on the data supplied by the FPDR and summarized in the data exhibits of the Valuation Report.

Assets as of June 30, 2018, were based on values provided by FPDR and the City of Portland and are detailed in the Valuation Report.

Methods / Policies

Actuarial Cost Method: Entry age normal, as described in the Valuation Report.

Provisions

Provisions valued are as detailed in the Valuation Report and reflect benefit provisions in effect as of June 30, 2018.

FPDR Two COLA: The Valuation Report was conducted assuming future COLAs for FPDR Two are a blended rate. The blended rate is determined by applying a 2.00% COLA for service prior to October 8, 2013 and a 1.25% COLA for service thereafter

Appendix

Actuarial Basis

Assumptions for Valuation Calculations

As described in the Valuation Report.

Assumptions for Levy Adequacy Analysis

As described in the Valuation Report except where modified by the deviations and additions noted in this Appendix.

Real Market Value (RMV) of real estate subject to property taxes: \$149.692 billion as of the beginning of 2018 as reported by the City and FPDR. It is our understanding that amount served as the basis for calculations for property tax bills sent in October 2018 to fund FPDR for the fiscal year running from July 1, 2018 to June 30, 2019 (FYE 2019). No estimate is made for urban renewal excess in the model per our understanding (from consultation with TSCC) that county assessors do not track urban renewal excess value for RMVs. Since assessors lack that information, the RMV amount without any reduction for urban renewal excess is an appropriate determination basis for evaluating the \$2.80 levy limit.

Increase in RMV: Based on consultation with the City's economist, projected with 5.0% growth in the first year of our model and a 4.5% geometric average annual compounded growth thereafter. Growth patterns vary in our stochastic model with the exception of the first year.

Administrative & Operating Expenses: A component of the Total Requirements, based on consultation with FPDR this is modeled as \$4.09 million in the first year of our model and in subsequent years is assumed to increase with CPI, which varies in our stochastic model.

Short-Term Disability & Disability-Related Medical Costs: A component of the Total Requirements, based on consultation with FPDR staff this is modeled as \$4.60 million in the first year of our model and in subsequent years it is assumed to increase with CPI plus 2.25%, with CPI varying in our stochastic model.

Appendix

Actuarial Basis

Assumptions for Levy Adequacy Analysis (continued)

IAP Contribution to OPERS for FPDR Three members: A component of the Total Requirements, assumed to be 9% of FPDR Three payroll throughout the payment period.

OPSRP Contribution to OPERS for FPDR Three members: A component of the Total Requirements. This will vary based on future investment experience of the OPERS program. It is assumed in this model that the current OPERS assumptions and rate calculation methods will remain consistent throughout the projection period. Detailed information on those methods can be found in the December 31, 2017 System-Wide Actuarial Valuation Report for Oregon PERS.

Overtime effect on FPDR Three base payroll subject to OPERS contributions: Throughout the projection it is assumed that overtime pay subject to OPERS contributions will be 16% of base FPDR Three payroll.

Adjustments to Total Requirements to Estimate Final Levy: Three adjustments are made as detailed below. For years after FYE2018 of our model, the net combined adjustment is to increase Total Requirements by 5.6%.

Other sources of revenue: Multiply by 0.97 (equal to one hundred percent minus 3.0 percent)

Adjustment for property tax discounts and delinquencies: Multiply by 1.04493 (equal to one divided by one minus 4.3 percent)

Adjustment for estimated effects of tax compression: Based on information provided by FPDR and the City's economist, multiply by the following factors:

FYE2019 – 1.04712 (equal to one divided by one minus 4.5 percent)

Later fiscal years – 1.04167 (equal to one divided by one minus 4.0 percent)

Appendix

Actuarial Basis

Assumptions for Levy Adequacy Analysis (continued)

CPI: Varies in our stochastic model. Average geometric annual compounded growth of 2.50%.

Oregon PERS Investment Returns: Return for calendar year 2018 is assumed to be -5.00%. Returns for 2019 and beyond vary in our stochastic model. Average geometric annual compounded growth for the post-2018 period is approximately 6.7%.

COLA increases: For FPDR One members, COLA increases are assumed to be equal to the projected wage growth in a given year and are assumed to remain level in years where projected wage growth is negative.

For FPDR Two retirement-related benefits, the baseline levy modeling assumes annual COLA increases a blend of 2.00% (for service prior to October 8, 2013) and 1.25% (for service after that date).

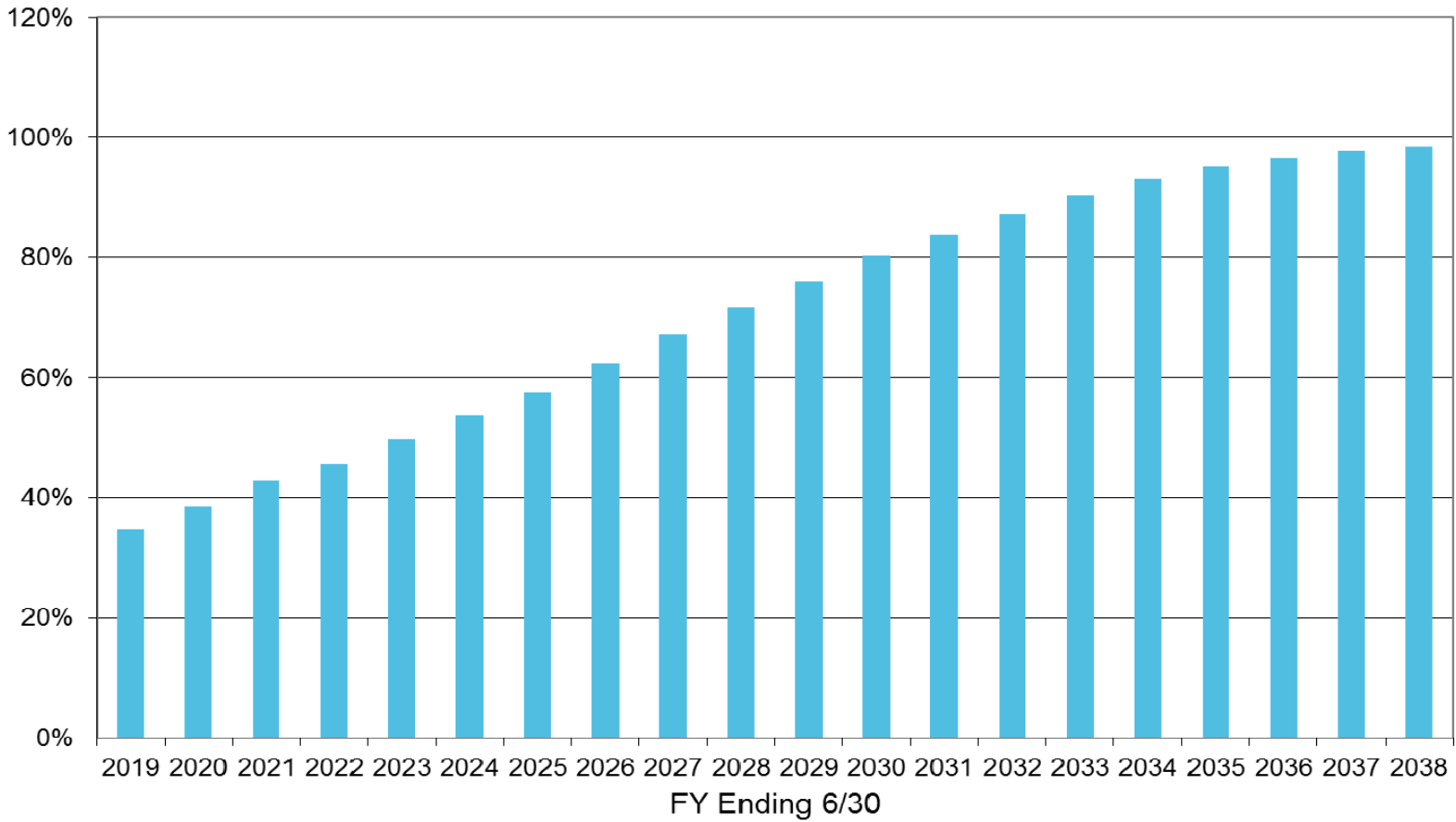
For FPDR Three, retirement-related benefits, COLA increases are assumed to be applied according to current rules for the OPERS program (“full PERS”).

Wage growth: Varies in our stochastic model. Each year’s projected wage growth is equal to projected CPI plus 1.00%.

New entrants and system pay growth: No new members are assumed to be eligible for FPDR One or FPDR Two benefits; all new entrants are assumed to become members under the FPDR Three/OPSRP benefit formula. Payroll for FPDR Three new entrant members is expected to grow such that overall system pay would grow at 3.75% if inflation was 2.75%, consistent with the valuation assumption.

Appendix

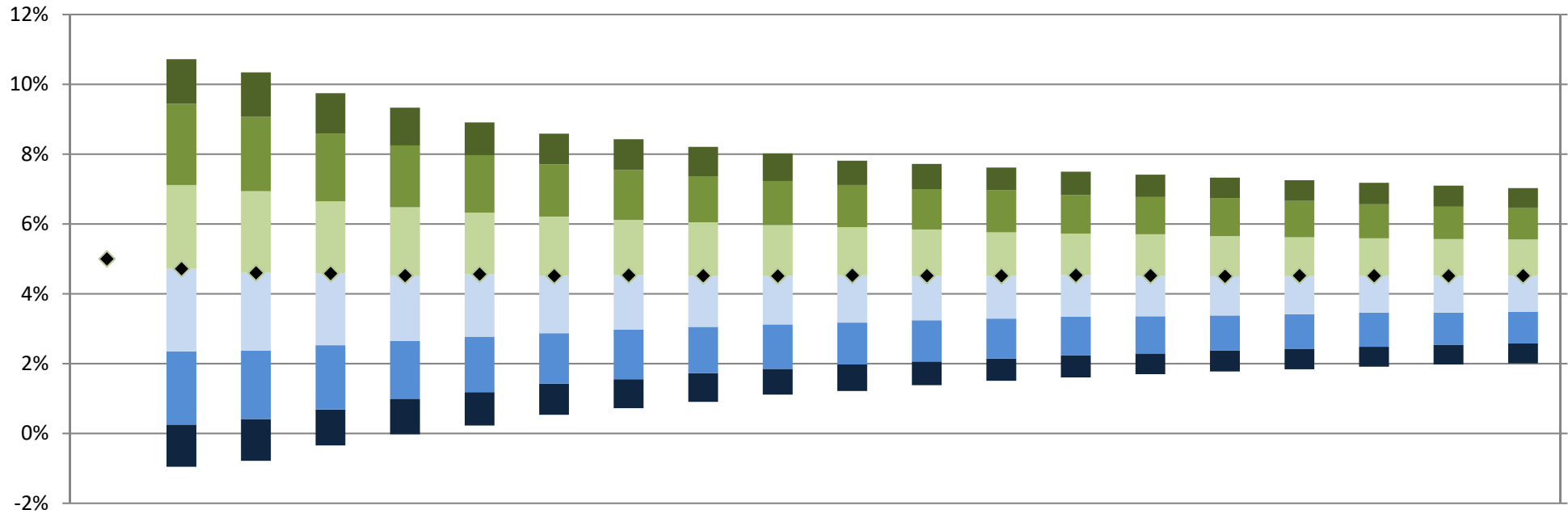
Proportion of Active Payroll that is FPDR Three



FY Ending 6/30	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FPDR Three Pay as % of Total	35%	38%	43%	46%	50%	54%	58%	62%	67%	72%	76%	80%	84%	87%	90%	93%	95%	97%	98%	98%

Appendix

Cumulative Annualized Geometric Growth in RMV

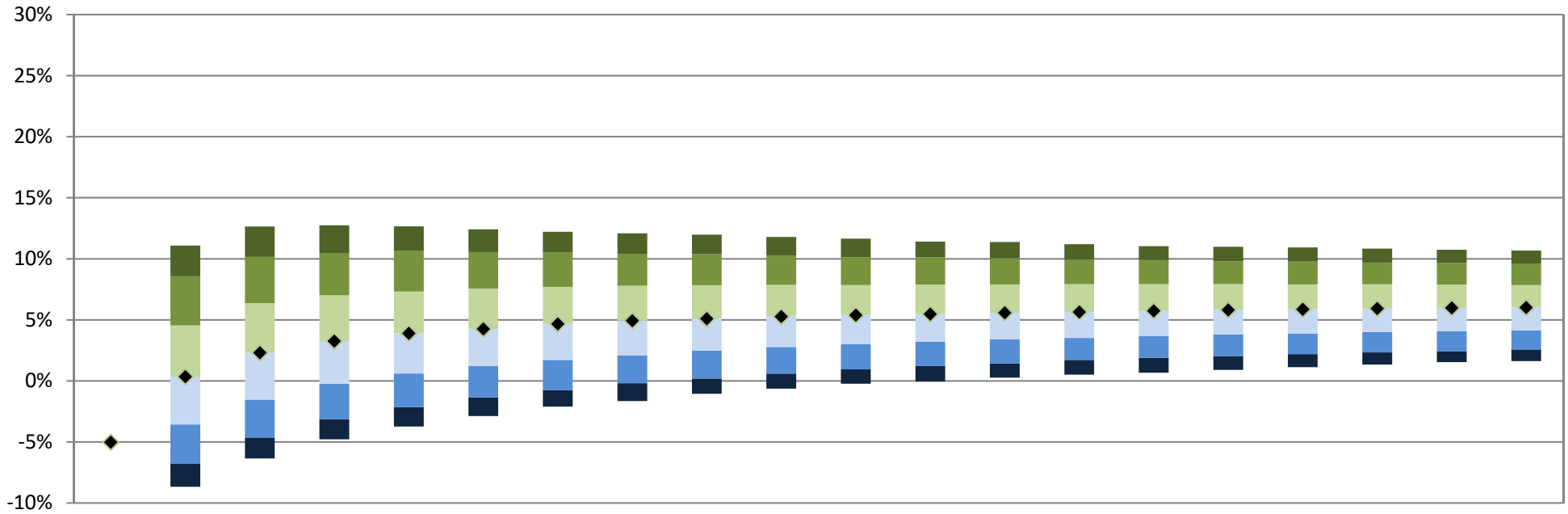


CY Ending 12/31	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
95th	5.0%	10.7%	10.3%	9.7%	9.3%	8.9%	8.6%	8.4%	8.2%	8.0%	7.8%	7.7%	7.6%	7.5%	7.4%	7.3%	7.3%	7.2%	7.1%	7.0%
90th	5.0%	9.4%	9.1%	8.6%	8.3%	8.0%	7.7%	7.5%	7.4%	7.2%	7.1%	7.0%	7.0%	6.8%	6.8%	6.7%	6.7%	6.6%	6.5%	6.5%
75th	5.0%	7.1%	6.9%	6.7%	6.5%	6.3%	6.2%	6.1%	6.0%	6.0%	5.9%	5.8%	5.8%	5.7%	5.7%	5.7%	5.6%	5.6%	5.6%	5.6%
50th	5.0%	4.7%	4.6%	4.6%	4.5%	4.6%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
25th	5.0%	2.3%	2.4%	2.5%	2.7%	2.8%	2.9%	3.0%	3.1%	3.1%	3.2%	3.2%	3.3%	3.3%	3.4%	3.4%	3.4%	3.5%	3.5%	3.5%
10th	5.0%	0.3%	0.4%	0.7%	1.0%	1.2%	1.4%	1.6%	1.7%	1.8%	2.0%	2.1%	2.1%	2.2%	2.3%	2.4%	2.4%	2.5%	2.5%	2.6%
5th	5.0%	-1.0%	-0.8%	-0.3%	0.0%	0.2%	0.5%	0.7%	0.9%	1.1%	1.2%	1.4%	1.5%	1.6%	1.7%	1.8%	1.8%	1.9%	2.0%	2.0%

This work product was prepared solely for FPDR and the City of Portland for the purposes stated herein, and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Appendix

Cumulative Annualized Geometric Investment Return on Oregon PERS Fund



CY Ending 12/31	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
95th	-5.0%	11.1%	12.7%	12.7%	12.7%	12.4%	12.2%	12.1%	12.0%	11.8%	11.7%	11.4%	11.4%	11.2%	11.0%	11.0%	10.9%	10.8%	10.7%	10.7%
90th	-5.0%	8.6%	10.2%	10.5%	10.6%	10.6%	10.5%	10.4%	10.4%	10.3%	10.1%	10.1%	10.0%	9.9%	9.9%	9.8%	9.8%	9.7%	9.7%	9.6%
75th	-5.0%	4.6%	6.4%	7.0%	7.3%	7.6%	7.7%	7.8%	7.8%	7.9%	7.9%	7.9%	7.9%	7.9%	7.9%	7.9%	7.9%	7.9%	7.9%	7.9%
50th	-5.0%	0.4%	2.3%	3.3%	3.9%	4.3%	4.7%	5.0%	5.1%	5.3%	5.4%	5.5%	5.6%	5.7%	5.8%	5.8%	5.9%	5.9%	6.0%	6.0%
25th	-5.0%	-3.6%	-1.5%	-0.2%	0.6%	1.2%	1.7%	2.1%	2.5%	2.8%	3.0%	3.2%	3.4%	3.5%	3.7%	3.8%	3.9%	4.0%	4.1%	4.2%
10th	-5.0%	-6.8%	-4.6%	-3.1%	-2.1%	-1.3%	-0.8%	-0.2%	0.2%	0.6%	1.0%	1.2%	1.4%	1.7%	1.9%	2.0%	2.2%	2.3%	2.4%	2.6%
5th	-5.0%	-8.7%	-6.3%	-4.8%	-3.7%	-2.9%	-2.1%	-1.6%	-1.0%	-0.6%	-0.2%	0.0%	0.3%	0.5%	0.7%	0.9%	1.1%	1.3%	1.5%	1.6%

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