Memorandum

TO: Police and Fire Department Retirement Plan and Federated City Employees' Retirement System Investment Committees

FROM: Jay Kwon, Arun Nallasivan

SUBJECT: Staff Recommendation to update Prefunding Discount Rate Calculation

DATE: February 22, 2022

Summary

As the Plan Sponsor for both the Federated City Employees' Retirement System and the Police and Fire Department Retirement Plan, the City of San Jose has an annual option to "select the advance periodic basis on which city contributions to the medical benefits account and to the retirement fund for that fiscal year will be paid."[1] If the City makes prepayments in advance of the standard schedule, the prepayment(s) are discounted. The Boards of the Plans can dictate the size of the discount given to the City as long as the "amount of the advance periodic payments … shall be as determined by the board to be actuarially equivalent to the monthly or biweekly payment that would otherwise have been required."[2]

The Boards adopted a framework for calculating the prefunding discount in 2014. The framework provides Trustees with a consistent methodology each year, but is not intended to be prescriptive or adopted without discussion; trustees as always are able to make adjustments as needed, assuming compliance with the relevant regulations. The 2014 framework was crafted with triggers based on specific economic and financial metrics. Staff recommends revising the framework to include market valuation as an additional metric.

Background

Between 2008 and 2014, the Boards used the assumed rate of investment return in calculating actuarial equivalence, and the City regularly exercised the option to prefund employer retirement contributions in a lump sum at the start of the fiscal year. In 2014, the Boards were advised that they had "discretion to direct its actuary to use a lower discount rate for the purpose of determining actuarial equivalence under section 3.36.1590(C)."[3] Staff proposed the creation of a "framework for the Pension Plans to incentivize

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[1] San Jose Municipal Code 3.36.1590(C)
[2] San Jose Municipal Code 3.36.1590(C)
[3] "Board Discretion Regarding The Discount Rate Used For Determining Actuarial Equivalence Of The City's Pre-Funding Option," Reed Smith, 4/20/15

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the City to prefund contributions when market valuations are low and the economic cycle is in the early stages of expansion and create a disincentive for the City to prefund contributions when market valuations and/or economic expansions are beyond historic norms."[4] The "incentive" came in the form of an adjusted discount rate, based on economic and market conditions.

The 2014 framework identified conditions in which the assumed rate of investment return did not correctly discount a future payment. The assumed rate of investment return as adopted by each Plan is the Plan's estimated average annual return over the next twenty-plus years; the assumed rate is not an estimate of the return in any given single year. When return expectations are lower than average, allowing the City to prefund at the full discount rate over-prices the value of prefunding, and can create a potential headwind for the Plan's investment portfolio.

Certainly, forecasting short-term market returns is at best an inaccurate exercise, but the lack of any effort to do so gives the City a free option at the expense of the Plans. The 2014 framework acknowledges the potential futility of short-term market predictions by keeping the triggers simple, and the adjustments small; the recommended modification does the same.

The 2014 framework included two triggers implemented over a three-year period:

First Year Methodology

If on September 1st of a given year an economic expansion has exceeded 58 months (as defined by the NBER) in duration and/or the S&P 500 has returns in excess of 130 percent, the Office of Retirement Services will inform the City's Budget Office of its intent to reduce the discount rate for prefunding by 15% in the coming year.

Second Year Methodology

If on September 1st of the subsequent year an economic expansion continues to exceed 58 months (as defined by the NBER) in duration and/or the S&P 500 has returns still in excess of 130 percent, the Office of Retirement Services will inform the City's Budget Office of its intent to reduce the discount rate for prefunding by an additional 15% in the coming year.

Third Year Methodology

If on September 1st of third year an economic expansion which continues to exceed 58 months (as defined by the NBER) in duration and/or the S&P 500 has returns still in excess of 130 percent, the Office of Retirement Services will inform the City's Budget Office of its intent to reduce the discount rate for prefunding by an additional 15% in the coming year and maintain that level for all subsequent years or until market valuations and/or economic expansion reverts to historic norms.

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[4] "Prefunding Risk Mitigation Process Recommendation," Staff Memorandum, 9/15/14

Revising the Methodology

While the two triggers (economic expansion and S&P 500 index returns) were appropriately designed for the times, current market conditions suggest that the methodology could benefit from revision. The economy and markets have rebounded quickly and sharply from the Covid crisis in March 2020, but neither existing trigger would apply despite historically expensive equity market valuations. Staff recommends the addition of a third metric, Cyclically Adjusted Price / Earnings ratio (CAPE), to account for situations such as the current market environment.

CAPE is a long-term price earnings ratio designed to minimize the volatility of earnings over a cycle. The ratio is calculated by dividing the current price by the average of the earnings over the trailing ten-years, adjusted for inflation. The ratio can be calculated for any company or index, but is most widely applied to the S&P 500. The stability of the denominator creates a signal that moves largely in line with the numerator, i.e. price, as intended. An above average CAPE ratio can be considered an indicator of a correspondingly above average market valuation.

As with the first two triggers, the end goal in utilizing the CAPE ratio is help identify extreme market environments. The aforementioned inaccuracy of short-term forecasting makes it impractical or pointless to make granular adjustments based on weak market signals. Instead, the revised methodology recommends setting the trigger level at two standard deviations above the long-term mean, which should happen less than 3% of the time.

Additionally, CAPE is a well-studied and much discussed metric, and is as readily available as statistics from the NBER or simple market returns. Using CAPE keeps the prefunding methodology transparent and accessible. There are multiple "flavors" of CAPE that attempt to account for disparate accounting regulations over time, or different dividend payout behaviors, but most of the differing versions are highly correlated. Likewise, staff recommends using CAPE on the S&P 500 despite acknowledging that the investment portfolio is global because equity indices in general are highly correlated across regions, especially in extreme scenarios.

Staff recommends modifying the methodology to the following:

First Year Methodology

If on September 1st of a given year an economic expansion has exceeded 58 months (as defined by the NBER) in duration and/or the S&P 500 has returns in excess of 130 percent and/or the S&P 500 CAPE ratio is two standard deviations above the historical average, the Office of Retirement Services will inform the City's Budget Office of its intent to reduce the discount rate for prefunding by 15% in the coming year.

Second Year Methodology

If on September 1st of the subsequent year an economic expansion continues to exceed 58 months (as defined by the NBER) in duration and/or the S&P 500 has returns still in excess of 130 percent

and/or the S&P 500 CAPE ratio is two standard deviations above the historical average, the Office of Retirement Services will inform the City's Budget Office of its intent to reduce the discount rate for prefunding by an additional 15% in the coming year.

Third Year Methodology

If on September 1st of third year an economic expansion which continues to exceed 58 months (as defined by the NBER) in duration and/or the S&P 500 has returns still in excess of 130 percent and/or the S&P 500 CAPE ratio is two standard deviations above the historical average, the Office of Retirement Services will inform the City's Budget Office of its intent to reduce the discount rate for prefunding by an additional 15% in the coming year and maintain that level for all subsequent years or until market valuations and/or economic expansion reverts to historic norms.

The appendix includes historical discount rates, trigger levels, and the calculated prefunding rates using the old and recommended methodologies.

APPENDIX

2014 Framework vs. Recommended

		Business Cycle	S&P 500	CAPE Ratio	Discount Rates		2014 Framework			Recommended Framework			
FY Year (start)	Analysis Date	Trigger (>58)	Trigger (>130%)	Trigger (>2SD)	Fed (%)	P&F (%)	Trigger	Fed Prefunding Discount	PF Prefunding Discount	Trigger	Fed Prefunding Discount	PF Prefunding Discount	One Yr Forward S&P 500 Returns
1997	9/30/96	Yes	No	Yes	8.250	8.000	Yes	7.0125	6.8000	Yes	7.0125	6.8000	39%
1998	9/30/97	Yes	Yes	Yes	8.250	8.000	Yes	5.7750	5.6000	Yes	5.7750	5.6000	9%
1999	9/30/98	Yes	Yes	Yes	8.250	8.000	Yes	4.5375	4.4000	Yes	4.5375	4.4000	29%
2000	9/30/99	Yes	No	Yes	8.250	8.000	Yes	4.5375	4.4000	Yes	4.5375	4.4000	11%
2001	9/30/00	Yes	No	Yes	8.250	8.000	Yes	4.5375	4.4000	Yes	4.5375	4.4000	-29%
2002	9/30/01	Yes	No	No	8.250	8.000	Yes	4.5375	4.4000	Yes	4.5375	4.4000	-17%
2003	9/30/02	No	No	No	8.250	8.000	No	8.250	8.0000	No	8.2500	8.0000	17%
2004	9/30/03	No	No	No	8.250	8.000	No	8.250	8.0000	No	8.2500	8.0000	10%
2005	9/30/04	No	No	No	8.250	8.000	No	8.250	8.0000	No	8.2500	8.0000	10%
2006	9/30/05	No	No	No	8.250	8.000	No	8.250	8.0000	No	8.2500	8.0000	7%
2007	9/30/06	Yes	No	No	8.250	8.000	Yes	7.0125	6.8000	Yes	7.0125	6.8000	14%
2008	9/30/07	Yes	No	No	8.250	8.000	Yes	5.7750	5.6000	Yes	5.7750	5.6000	-19%
2009	9/30/08	Yes	No	No	8.250	8.000	Yes	4.5375	4.4000	Yes	4.5375	4.4000	-14%
2010	9/30/09	No	No	No	7.750	8.000	No	7.750	8.0000	No	7.7500	8.0000	7%
2011	9/30/10	No	No	No	7.950	7.750	No	7.950	7.7500	No	7.9500	7.7500	5%
2012	9/30/11	No	No	No	7.500	7.500	No	7.500	7.5000	No	7.5000	7.5000	23%
2013	9/30/12	No	No	No	7.500	7.250	No	7.500	7.2500	No	7.5000	7.2500	17%
2014	9/30/13	No	No	No	7.250	7.125	No	7.250	7.1250	No	7.2500	7.1250	18%
2015	9/30/14	Yes	Yes	No	7.000	7.000	Yes	5.9500	5.9500	Yes	5.9500	5.9500	-2%
2016	9/30/15	Yes	Yes	No	7.000	7.000	Yes	4.9000	4.9000	Yes	4.9000	4.9000	11%
2017	9/30/16	Yes	No	No	6.875	6.875	Yes	3.7813	3.7813	Yes	3.7813	3.7813	16%
2018	9/30/17	Yes	No	Yes	6.875	6.875	Yes	3.7813	3.7813	Yes	3.7813	3.7813	16%
2019	9/30/18	Yes	No	Yes	6.750	6.750	Yes	3.7125	3.7125	Yes	3.7125	3.7125	3%
2020	9/30/19	Yes	No	No	6.750	6.750	Yes	3.7125	3.7125	Yes	3.7125	3.7125	13%
2021	9/30/20	No	No	No	6.625	6.625	No	6.625	6.6250	No	6.6250	6.6250	32%
2022	9/30/21	No	No	Yes	6.625	6.625	No	6.625	6.6250	Yes	5.6313	5.6313	

Trigger level detail

		Business Cycle		Business Cy	S&P 500				S&P 500	CAPE Ratio		CAPE Ratio
FY Year (start)	Analysis Date	Most Recent Prior Business Cycle Trough	Months of Expansion	Trigger (>58)	Most Recent S&P 500 Trough	S&P 500 Trough Level	S&P 500 on Analysis Date	Returns	Trigger (>130%)	CAPE Ratio	2 Std Dev	Trigger (>2SD)
1997	9/30/96	3/30/1991	67	Yes	10/31/1990	307.12	674.88	120%	No	25.7	24.3	Yes
1998	9/30/97	3/30/1991	79	Yes	10/31/1990	307.12	937.02	205%	Yes	32.7	24.8	Yes
1999	9/30/98	3/30/1991	91	Yes	10/31/1990	307.12	1020.64	232%	Yes	33.5	25.6	Yes
2000	9/30/99	3/30/1991	104	Yes	10/31/1998	1032.47	1318.17	28%	No	41.3	26.8	Yes
2001	9/30/00	3/30/1991	116	Yes	10/31/1998	1032.47	1468.05	42%	No	41.9	28.0	Yes
2002	9/30/01	3/30/1991	128	Yes	10/31/1998	1032.47	1044.64	1%	No	27.7	28.6	No
2003	9/30/02	11/30/2001	10	No	10/31/1998	1032.47	867.81	-16%	No	22.4	28.8	No
2004	9/30/03	11/30/2001	22	No	10/31/2002	854.63	1019.44	19%	No	25.2	28.9	No
2005	9/30/04	11/30/2001	35	No	10/31/2002	854.63	1117.66	31%	No	25.7	29.0	No
2006	9/30/05	11/30/2001	47	No	10/31/2002	854.63	1225.92	43%	No	25.7	29.2	No
2007	9/30/06	11/30/2001	59	Yes	10/31/2002	854.63	1317.74	54%	No	25.6	29.3	No
2008	9/30/07	11/30/2001	71	Yes	10/31/2002	854.63	1497.12	75%	No	26.7	29.5	No
2009	9/30/08	11/30/2001	83	Yes	10/31/2002	854.63	1216.95	42%	No	20.4	29.6	No
2010	9/30/09	6/30/2009	3	No	3/31/2009	757.13	1044.55	38%	No	18.8	29.5	No
2011	9/30/10	6/30/2009	15	No	3/31/2009	757.13	1122.08	48%	No	20.4	29.5	No
2012	9/30/11	6/30/2009	27	No	3/31/2009	757.13	1173.88	55%	No	19.7	29.5	No
2013	9/30/12	6/30/2009	40	No	3/31/2009	757.13	1443.42	91%	No	21.8	29.6	No
2014	9/30/13	6/30/2009	52	No	3/31/2009	757.13	1687.17	123%	No	23.4	29.6	No
2015	9/30/14	6/30/2009	64	Yes	3/31/2009	757.13	1993.23	163%	Yes	25.9	29.7	No
2016	9/30/15	6/30/2009	76	Yes	3/31/2009	757.13	1944.41	157%	Yes	24.5	29.8	No
2017	9/30/16	6/30/2009	88	Yes	2/28/2016	2075.54	2157.69	4%	No	26.7	29.9	No
2018	9/30/17	6/30/2009	100	Yes	2/28/2016	2075.54	2492.84	20%	No	30.2	30.1	Yes
2019	9/30/18	6/30/2009	113	Yes	2/28/2016	2075.54	2901.5	40%	No	32.6	30.4	Yes
2020	9/30/19	6/30/2009	125	Yes	12/31/2018	2567.31	2982.156	16%	No	29.2	30.7	No
2021	9/30/20	4/30/2020	5	No	3/31/2020	2652.39	3365.5167	27%	No	30.8	30.8	No
2022	9/30/21	4/30/2020	17	No	3/31/2020	2652.39	4445.5433	68%	No	37.6	31.3	Yes

S&P 500 Price History

Trough month (Trough Quarter)	Contraction	Expansion	Cycle	
	Duration, peak to trough	Duration, trough to peak	Duration, trough to trough	Duration, peak to peak
December 1854 (1854Q4)				
December 1858 (1858Q4)	18	30	48	
June 1861 (1861Q3)	8	22	30	40
December 1867 (1868Q1)	32	46	78	54
December 1870 (1870Q4)	18	18	36	50
March 1879 (1879Q1)	65	34	99	52
May 1885 (1885Q2)	38	36	74	101
April 1888 (1888Q1)	13	22	35	60
May 1891 (1891Q2)	10	27	37	40
June 1894 (1894Q2)	17	20	37	30
June 1897 (1897Q2)	18	18	36	35
December 1900 (1900Q4)	18	24	42	42
August 1904 (1904Q3)	23	21	44	39
June 1908 (1908Q2)	13	33	46	56
January 1912 (1911Q4)	24	19	43	32
December 1914 (1914Q4)	23	12	35	36
March 1919 (1919Q1)	7	44	51	67
July 1921 (1921Q3)	18	10	28	17
July 1924 (1924Q3)	14	22	36	40
November 1927 (1927Q4)	13	27	40	41
March 1933 (1933Q1)	43	21	64	34
June 1938 (1938Q2)	13	50	63	93
October 1945 (1945Q4)	8	80	88	93
October 1949 (1949Q4)	11	37	48	45
May 1954 (1954Q2)	10	45	55	56
April 1958 (1958Q2)	8	39	47	49
February 1961 (1961Q1)	10	24	34	32
November 1970 (1970Q4)	11	106	117	116
March 1975 (1975Q1)	16	36	52	47
July 1980 (1980Q3)	6	58	64	74
November 1982 (1982Q4)	16	12	28	18
March 1991 (1991Q1)	8	92	100	108
November 2001 (2001Q4)	8	120	128	128
June 2009 (2009Q2)	18	73	91	81
April 2020 (2020Q2)	2	128	130	146