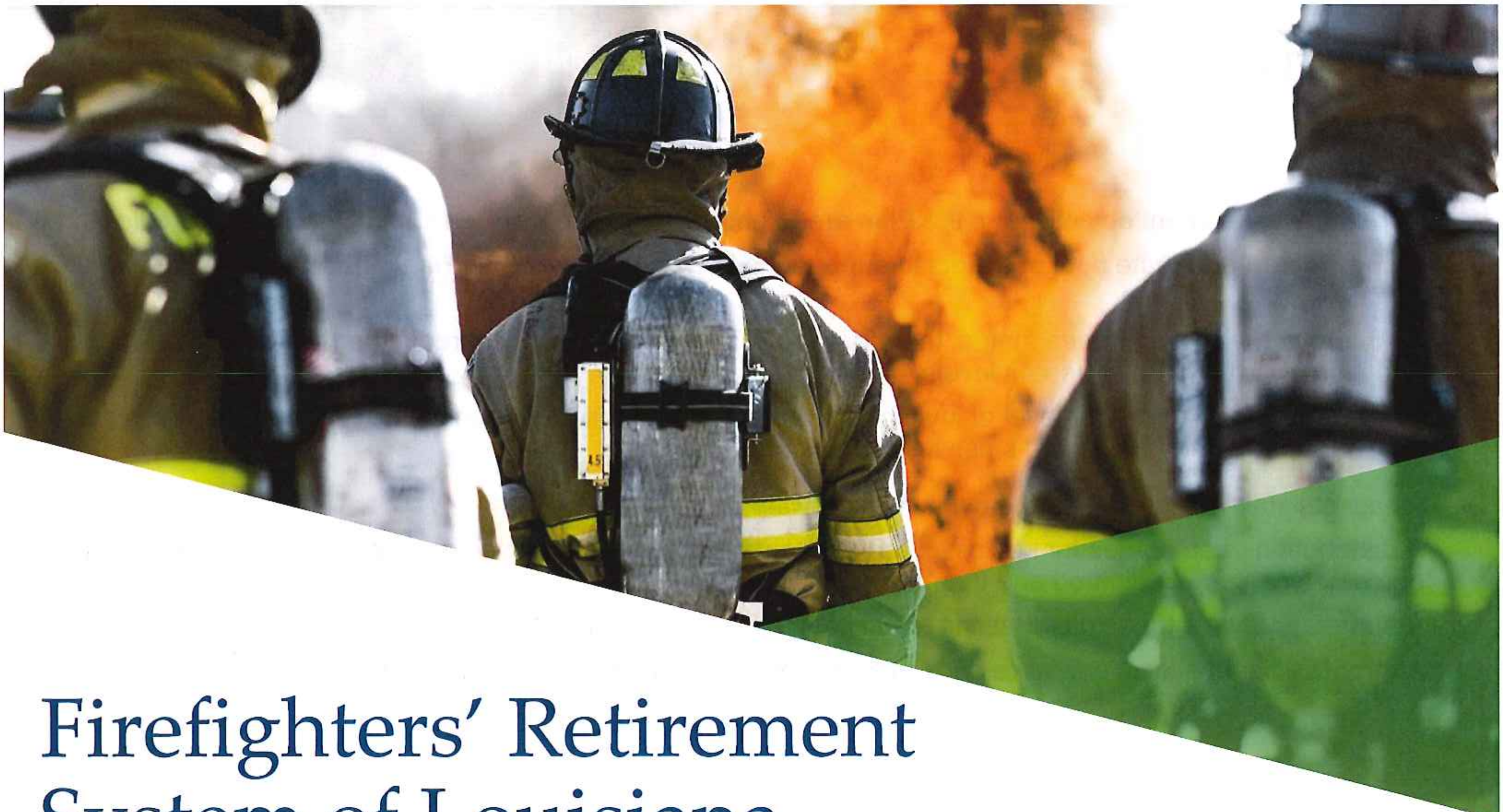


Firefighters' Retirement System of Louisiana

Stochastic Asset-Liability Modeling

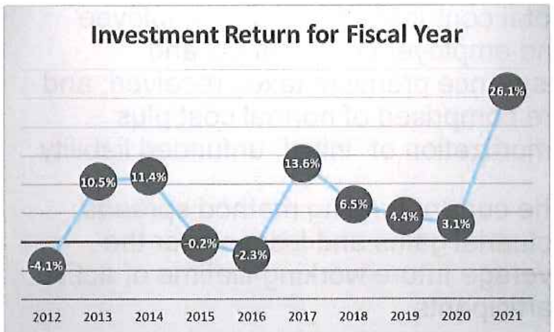
February 10, 2022 / David Palmerino, FSA, CFA / Jeffrey Boucek, CFA

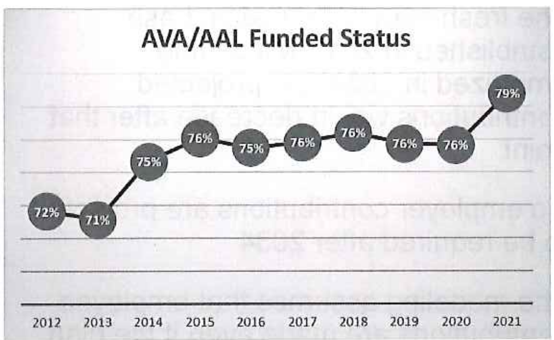
Segal Marco Advisors

Objectives

- The primary investment objectives of the Plan are to ensure, over the long-term life of the Plan, the following:
  - To provide an adequate pool of assets to support the benefit obligations to Plan participants, retirees and beneficiaries
  - To improve the Plan's funded status, therefore providing the opportunity to reduce employer contributions and ultimately to improve benefit levels (if desired)
  - Seeks to achieve a prudent level of investment return and portfolio risk, consistent with the Plan's projected cash flow needs and the Board's risk tolerance and preferences
- This asset/liability study seeks to provide the following:
  - A distribution of outcomes for key asset-liability variables, so that expected and possible worst-case case outcomes can be highlighted and quantified
  - A summary of how those distributions may change if the asset allocation is altered
  - Alternative asset allocations were chosen that either (a) reduce risk, (b) improve results, or both

Baseline Valuation Information



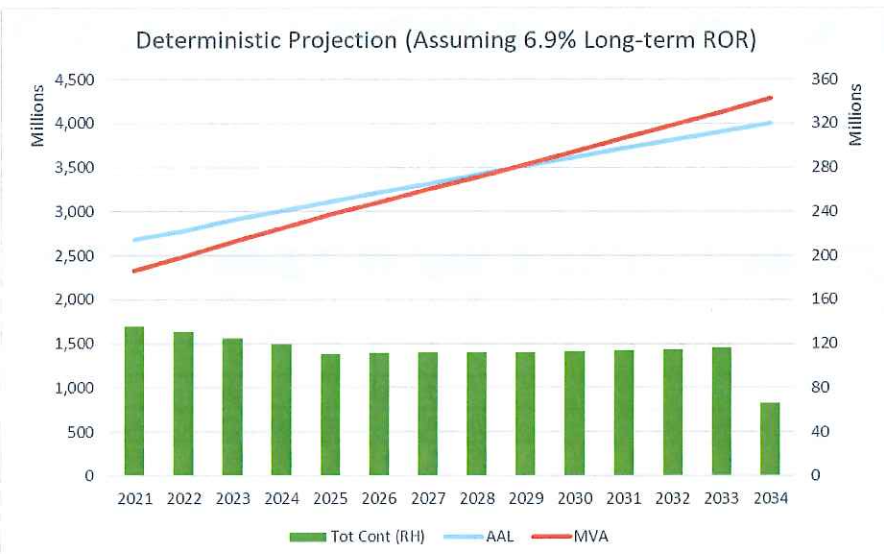


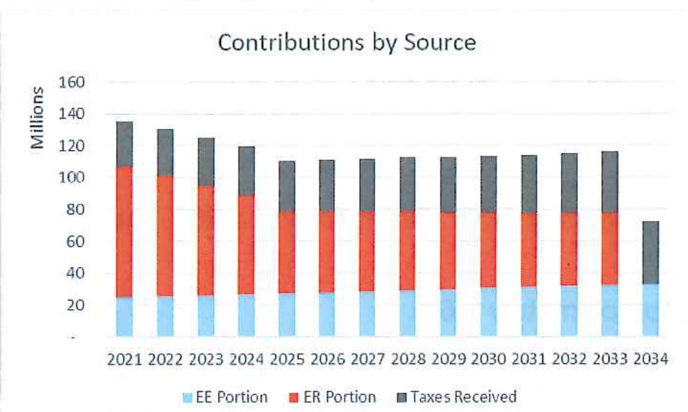
Census Data	30-Jun-2019	30-Jun-2020	30-Jun-2021
Active Participants	4,446	4,426	4,450
Terminated Participants	963	1,068	1,151
Retired Participants	2,407	2,497	2,578
Total Participants	7,816	7,991	8,179
Average Active Payroll ($)	54,074	55,532	55,991
Funding Metrics			
Market Value of Assets	1,778,931,314	1,837,689,661	2,326,798,869
Actuarial Value of Assets (AVA)	1,821,040,904	1,914,024,117	2,111,737,202
Discount Rate	7.15%	7.00%	6.90%
Present Value Future Benefits	3,001,464,309	3,214,041,115	3,403,877,879
Actuarial Accrued Liability (AAL)	2,405,122,324	2,530,844,605	2,681,184,069
Funded Ratio (MVA / AAL)	74%	73%	87%
Amortization Payment *	68,606,220	67,464,313	66,532,163
Administrative Cost	1,937,980	1,889,681	2,030,080
Employers Normal Cost *	35,708,523	44,796,726	45,438,572
Insurance Premium Taxes Due	(28,017,672)	(28,567,788)	(28,472,051)
Annual Required Contribution	78,235,051	85,582,932	85,528,764

* Adjusted for mid-year payment in the valuation report

- The plan was approximately 87% funded on an accrued liability basis at 6/30/2021 following a 26% rate of return for the fiscal year (79% using AVA rather than MVA)
- The compound rate of return over the past 10 fiscal years is approximately 6.6%
- The discount rate assumption was reduced with each of the past two valuations and is presently 6.9%

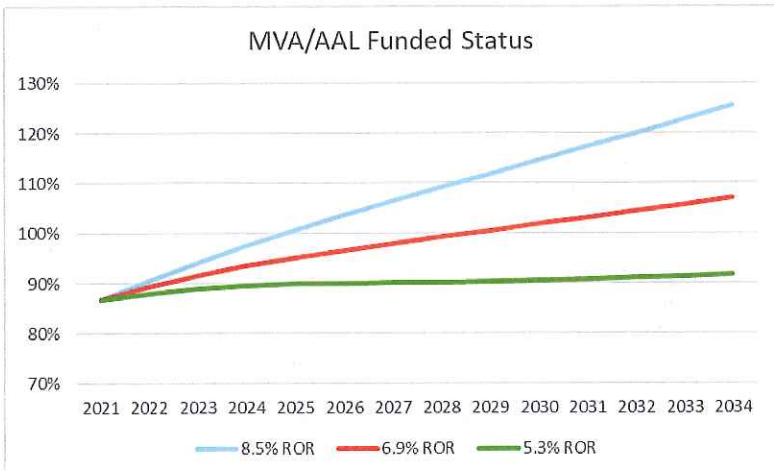
Deterministic Projections



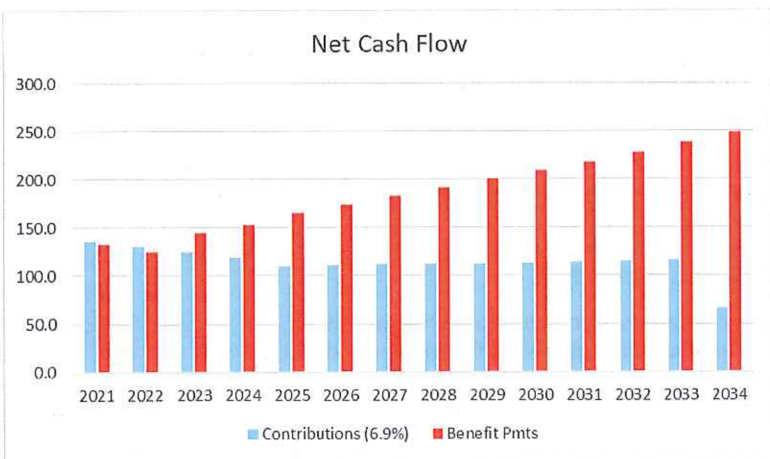


- Total contributions include employee and employer contributions and insurance premium taxes received; and are comprised of normal cost plus amortization of "initial" unfunded liability
- The current funding method spreads actuarial gains and losses over the average future working lifetime of active participants
- The fresh start amortization base established in 2019 will be fully amortized in 2034 and projected contributions would decrease after that point
- No employer contributions are projected to be required after 2034
- The modeling assumes that employee contributions are made even if the plan is overfunded

Deterministic Projections



- The projected rate of return has a dramatic impact on projected funded ratio
- If assets earn 8.5% the plan would reach full funding at 2025 (rather than at 2029 if the assets earn 6.9%)
- If assets earn only 5.3% the plan would only reach 92% by 2034

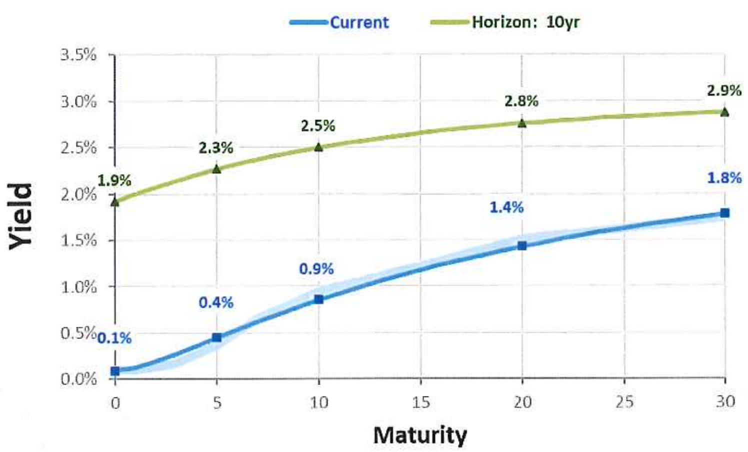


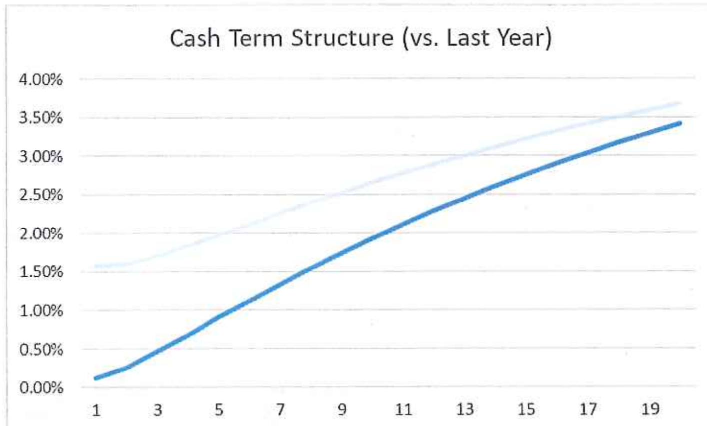
- Benefit payments are projected to be about equal to total contributions in the near-term, and then exceed contributions thereafter
- The total projected net cash outflow as a percentage of assets is expected to be in the range of 2-3% over the next decade
- When contributions are curtailed in 2034 the net cash outflow percentage could grow materially

Guiding Themes for 2021 Assumptions

Themes	Comments
Interest rates fall during 2020 in reaction to global pandemic caused by the Coronavirus.	• Yields drop by 100 basis points across the entire maturity spectrum in 2020, impacting the risk free rate and short term/cash projections at ten and twenty years for 2021 assumptions • Zero bound interest rates for many developed economies, with little or no U.S. Fed intervention projected until 2023
Low and slow global growth projected to resume in the second half of 2021. U.S. and global labor markets will take time to retool, re-educate and recover from effects of the pandemic.	• Breakeven inflation climbs above 2% as we move into February 2021. The Fed provides guidance indicating greater "tolerance" for inflationary periods above 2%, but still targeting 2% average. Wage inflation is a key driver • Global inflation projected to remain relatively low across developed and emerging markets
Central Banks' monetary and fiscal stimulus unprecedented in support of global shutdowns. Country debt levels reach record levels for many developed economies, with the potential for more stimulus	• Global fiscal stimulus totaling over $20 trillion appears to have partially mitigated an extended period of weak demand. Additional stimulus continues to be negotiated. The U.S. yield curve shifts down, though has steepened somewhat as we move into 2021. • Lower interest rates, and therefore lower risk free rates for our capital market assumptions, also drives risk premiums higher for several risk asset classes. • Changes to risk premiums are mixed across equities and alternatives.
Stable and recovering growth will depend on mankind's ability to control the Coronavirus with efficient distribution of efficacious vaccines and therapeutics. In the U.S., political uncertainty has been replaced with the "blue wave" democratic legislature and presidency.	• The new administration in the U.S. is keenly focused on getting vaccine shots in arms, however questions around regulation, taxes and trade and next in line. • Brexit moves ahead while trade agreements remain a sticking point. • While some broken supply chains have been reestablished, bottlenecks still exist across certain sectors like computer chip manufacturing and distribution.
Valuations across asset classes are still mixed, though U.S. equity prices remain high by most measures.	• Global monetary and fiscal accommodative measures continue to support equity markets. • Generally, fixed income reflects low yields, tight spreads, and high duration, however pockets of opportunity still exist. • With continued uncertainty regarding the virus, earnings sustainability remains questionable for global economies in 2021
Interest in private market investments still exists with some rich valuations and continued high levels of dry powder	• High prices and strong capital flows continue to be headwinds for mainstream strategies. • More attractive pricing inefficiencies may exist for smaller and niche equity and debt strategies. • Targeted long term expectations should reward patient and selective investors, with some volatility

2021 CMA Cash Model





	Cash Return for Horizon	Short Rate at Horizon	Treasury Yield at Year 10	Treasury Yield Today*	Yield Change First 10 Yrs
5 Yr	0.49%	0.98%	2.26%	0.45%	1.82%
10 Yr	1.01%	1.91%	2.50%	0.85%	1.64%
15 Yr	1.48%	2.64%	2.65%	1.18%	1.48%
20 Yr	**1.90%**	3.21%	2.76%	1.43%	1.33%

* From the model (not actual)

- **Long-term cash return is 1.90% (a reduction of 75bps** vs last yr.)
- Short rate is projected at 1.9% at year 10, below the Fed's median "longer run" forecast of 2.5%
- Treasury yields expected to increase 133-182 bps over the next 10 years
- Short rate remains below 0.50% until Year 3

Assumed sharpe ratio for long duration bonds in the model above is 0.005

Capital Market Assumptions

Correlations	US Equity	International	Emerging Market Equity	Global Equity	TIPS	Core Fixed Income	High Yield	Emerging Market Debt	Private Equity	Private Credit	Real Estate - Core	Infrastructure
US Equity	1	0.86	0.75	0.97	0.13	-0.09	0.78	0.53	0.56	0.52	-0.03	0.73
International	0.86	1	0.84	0.95	0.18	-0.05	0.78	0.69	0.59	0.48	-0.01	0.76
Emerging Market Equity	0.75	0.84	1	0.82	0.31	0.08	0.75	0.79	0.43	0.46	-0.12	0.71
Global Equity	0.97	0.95	0.82	1	0.17	-0.06	0.81	0.63	0.57	0.51	-0.05	0.77
TIPS	0.13	0.18	0.31	0.17	1	0.80	0.38	0.50	-0.26	0.20	-0.10	0.42
Core Fixed Income	-0.09	-0.05	0.08	-0.06	0.80	1	0.19	0.35	-0.40	0.07	-0.14	0.31
High Yield	0.78	0.78	0.75	0.81	0.38	0.19	1	0.71	0.44	0.71	-0.02	0.78
Emerging Market Debt	0.53	0.69	0.79	0.63	0.50	0.35	0.71	1	0.14	0.43	-0.10	0.77
Private Equity	0.56	0.59	0.43	0.57	-0.26	-0.40	0.44	0.14	1	0.31	0.34	0.42
Private Credit	0.52	0.48	0.46	0.51	0.20	0.07	0.71	0.43	0.31	1	0.12	0.54
Real Estate - Core	-0.03	-0.01	-0.12	-0.05	-0.10	-0.14	-0.02	-0.10	0.34	0.12	1	0.05
Infrastructure	0.73	0.76	0.71	0.77	0.42	0.31	0.78	0.77	0.42	0.54	0.05	1

Capital Market Assumptions

	Policy
US Equity	27.5%
International	11.5%
Emerging Market Equity	7.0%
Global Equity	10.0%
Total Equity	**56.0%**
TIPS	3.0%
Core Fixed Income	18.0%
High Yield	0.0%
Emerging Market Debt	5.0%
Total Fixed Income	**26.0%**
Private Equity	9.0%
Private Credit	0.0%
Real Estate - Core	6.0%
Infrastructure	3.0%
Total Alternative	**18.0%**
10 Year Expected Return (Arithmetic)	**6.7%**
10 Year Expected Return (Geometric)	**6.0%**
Standard Deviation	**12.2%**
Sharpe Ratio	**0.47**
20 Year Expected Return (Arithmetic)	**7.6%**
20 Year Expected Return (Geometric)	**6.9%**

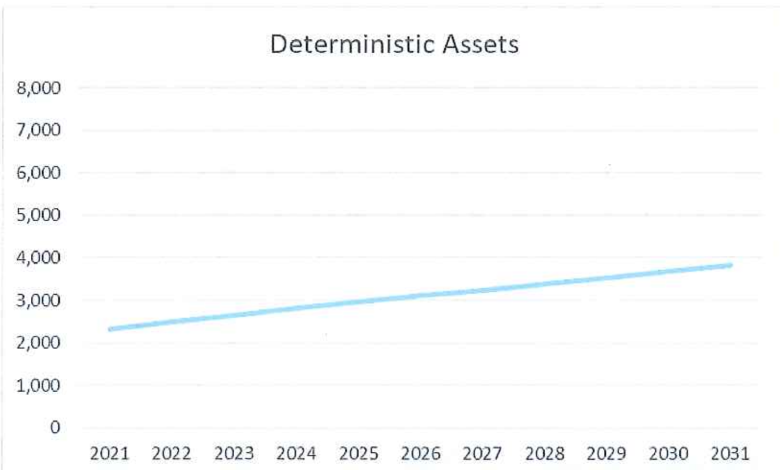
Source: IPS updated July 8, 2021

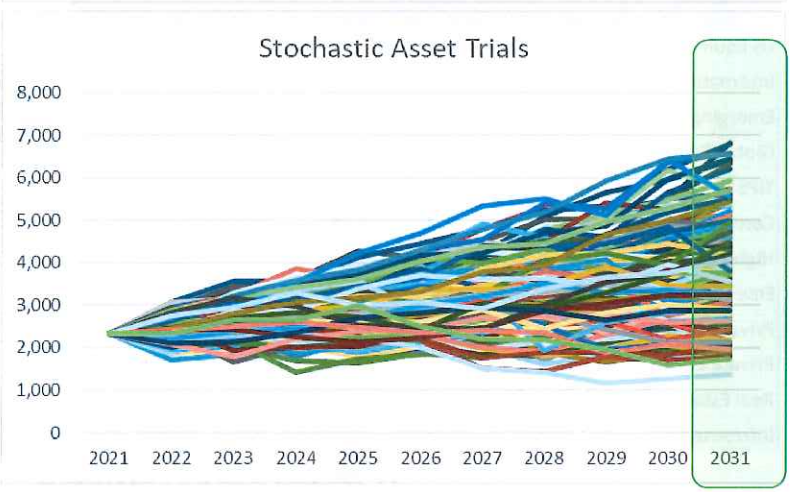
- The current portfolio has an expected annual return of 7.6% over the long-term with expected volatility of 12.2%; the expected ***compound return over the long-term is 6.9%***
- Expected returns over shorter to intermediate time horizons will trail the long-term expected return; the expected compound rate of return over the next decade is 6.0%
- These assumptions assume passive management

Asset Class Assumptions (10 Year)

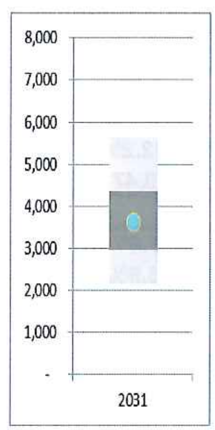
	Expected Return	Standard Deviation
US Equity	7.8%	18.6%
International	8.5%	20.0%
Emerging Market Equity	10.4%	25.0%
Global Equity	8.0%	18.4%
TIPS	1.7%	5.8%
Core Fixed Income	1.6%	5.0%
High Yield	4.3%	9.5%
Emerging Market Debt	4.5%	11.5%
Private Equity	11.8%	23.5%
Private Credit	7.0%	9.0%
Real Estate - Core	4.9%	12.5%
Infrastructure	7.0%	13.5%

Deterministic vs. Stochastic Projections





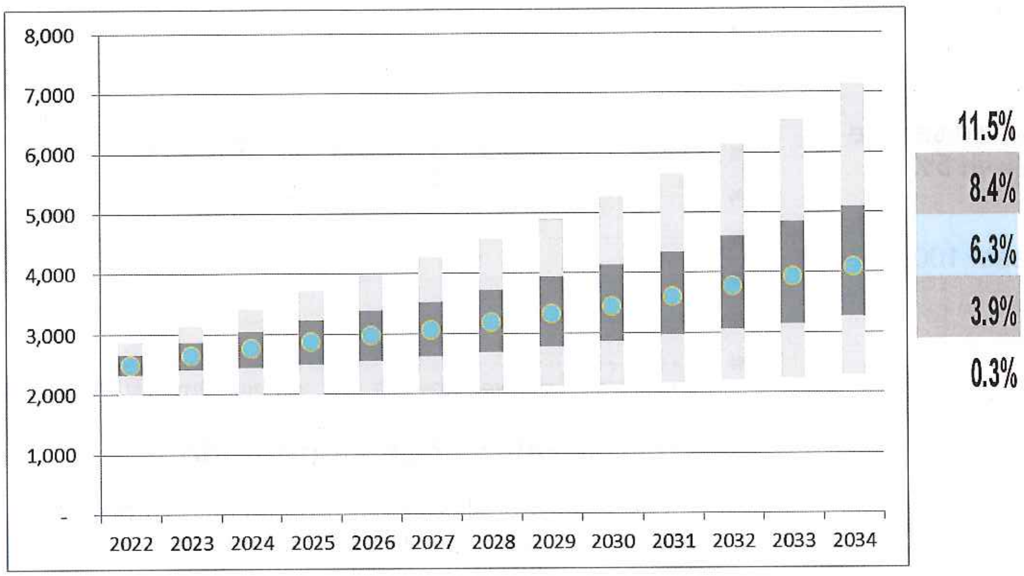
- Deterministic projections give the user an idea of expected values and directional trends
- Simple to understand and require few inputs
- Less useful for decision making as they do not provide information regarding distribution of outcomes or probabilities of unfavorable outcomes
- Stochastic projections use monte carlo simulation to perform thousands of trials for each year of the projection
- Results can be summarized as distributions, rather than point estimates



- The floating bar chart to the left summarizes the 90% confidence interval for a particular variable
- There is a 5% chance that the results falls above or below the value indicated
- The blue dot summarizes the median of the distribution

Stochastic Projections – Current Portfolio

Market Value of Assets



- The compound rate of return associated with the various percentile results is shown to the right of the chart
- While the long-term median compound rate of return is 6.9%, over the next 13 years the median result is 6.3%
- This is consistent with an increasing term structure of returns (that is, expected returns are higher later in the projection period, due mainly to anticipated rising bond yields)

- The projection of market value of assets assumes the annual required contribution will be made each year
- The median value of assets at 2034 is $4,100m (about 76% bigger than the value at June 30, 2021 of $2,327m) -- there is a 5% chance that the asset value is below $2,298m; and a 50% chance it is in the range of $3,262m-$5,105m
- In our simulations there is a ~43% chance the compound rate of return through 2033 is at least 6.9%

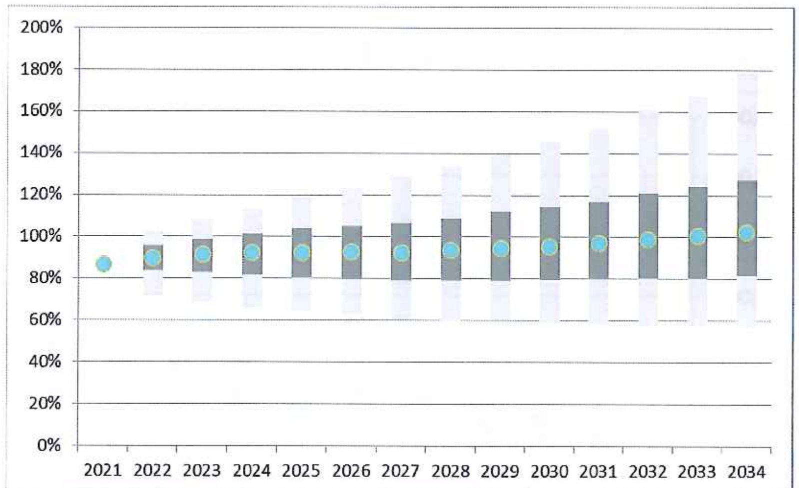
BOY 2021	*2,327*
Contributions	1,640
Bfts/Admin	2,392
Investments	2,525
EOY 2033	***4,100***

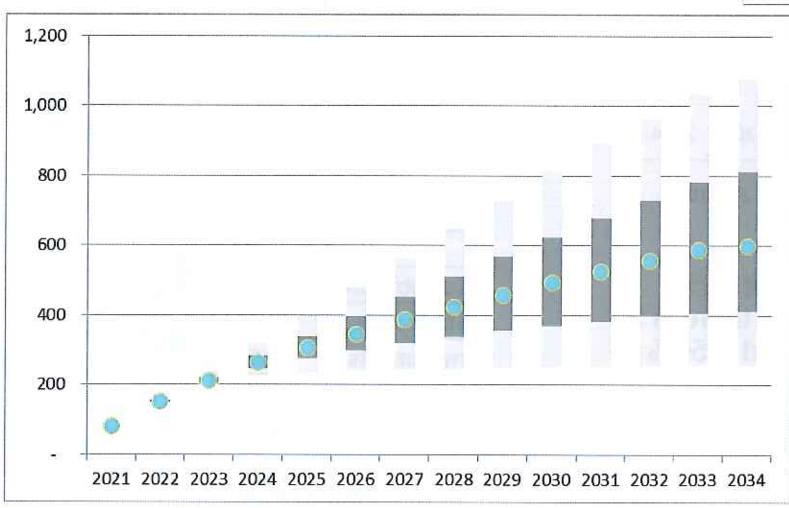
Aggregate projection of assets at the median through 2033

Stochastic Projections – Current Portfolio

Funded Ratio

- The plan is projected to be about 102% funded on an accrued liability basis in 2034 at the median
- Poor investment return scenarios could see the funded ratio drop to 57% by 2034 (with 5% probability)
- The probability that the plan is at least 100% funded in 2034 is about 53%





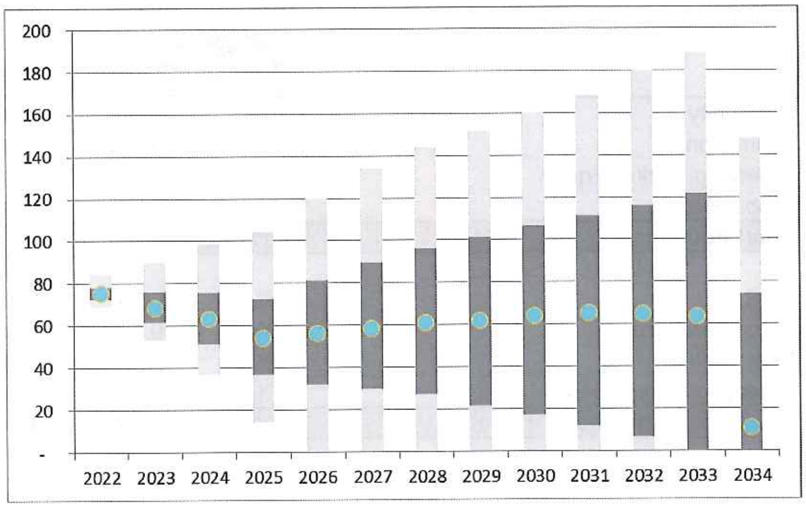
Present Value of ER Contributions

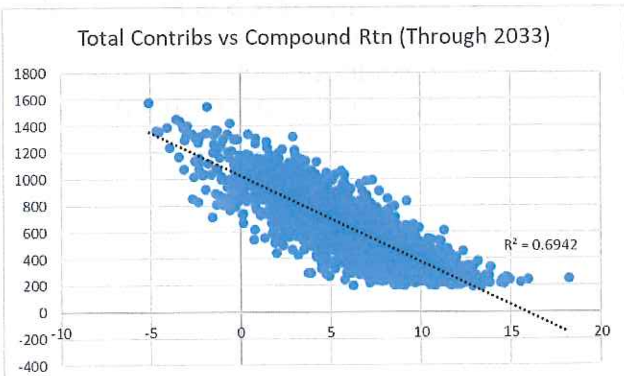
- The present value of contributions over the next fourteen years is $600m at the median
- There is a 5% chance that contributions might be as a high as $1,079m over the same period
- The funding method does not explicitly amortize gains/losses, but rather spreads them over average future service each year
- Total contributions are offset by employee contributions and insurance premium taxes due

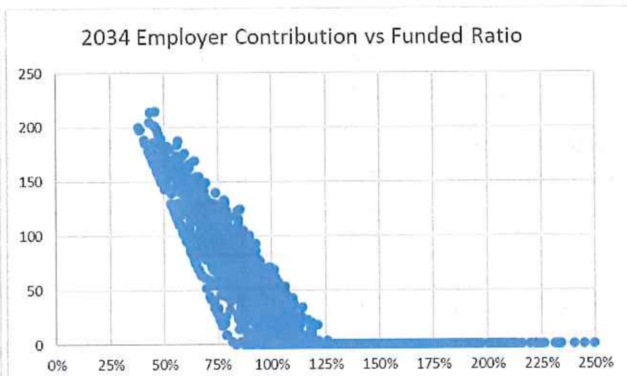
Stochastic Projections – Current Portfolio

Annual Employer Contributions

- Employer contributions are expected to drop off considerably after 2033 when the "initial" unfunded liability base is fully amortized
- Median contributions will be in the range of $60-70m over the next 13 years but poor investment return scenarios could see annual contributions approach 190m later in the projection
- After 2034 (not pictured) expected net cashflow percentage will drop materially due to reduced contributions







- The left chart shows influence of rate of return on contribs over the first 13 yrs of the projection
- The right chart shows employer contrib vs funded status in a single year
- Employer contrib is $0 **45% of the time in 2034**

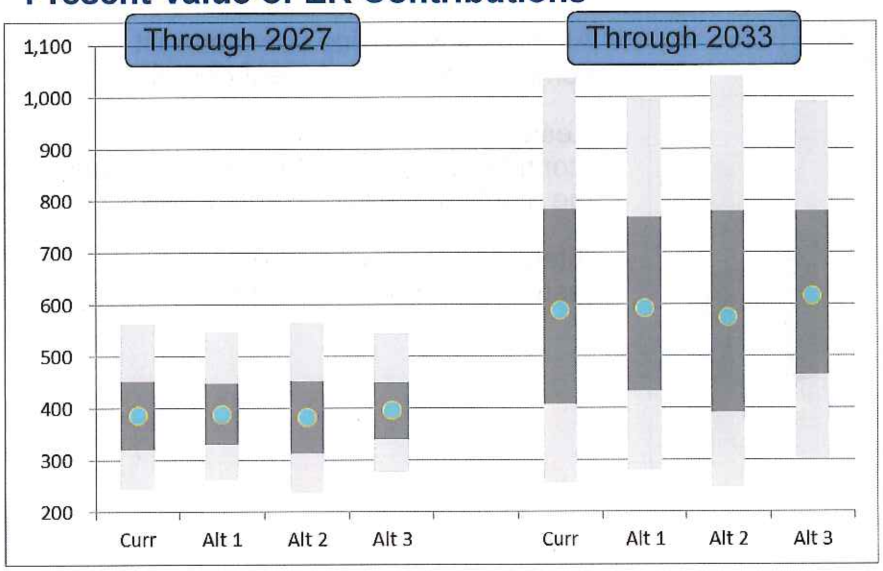
Alternative Portfolios

	Policy	Mix 1 Same Rtn as Policy	Mix 2 Same Risk as Policy	Mix 3 Least Risky
US Equity	27.5%	25.0%	33.0%	24.0%
International	11.5%	12.5%	16.0%	12.0%
Emerging Market Equity	7.0%	7.0%	7.0%	7.0%
Global Equity	10.0%	0.0%	0.0%	0.0%
Total Equity	**56.0%**	**44.5%**	**56.0%**	**43.0%**
TIPS	3.0%	3.0%	3.0%	3.0%
Core Fixed Income	18.0%	19.0%	16.0%	25.0%
High Yield	0.0%	3.0%	0.0%	0.0%
Emerging Market Debt	5.0%	5.0%	0.0%	5.0%
Total Fixed Income	**26.0%**	**30.0%**	**19.0%**	**33.0%**
Private Equity	9.0%	10.0%	9.0%	9.0%
Private Credit	0.0%	5.0%	5.0%	6.0%
Real Estate - Core	6.0%	5.5%	8.0%	6.0%
Infrastructure	3.0%	5.0%	3.0%	3.0%
Total Alternative	**18.0%**	**25.5%**	**25.0%**	**24.0%**
10 Year Expected Return (Arithmetic)	**6.7%**	**6.5%**	**6.9%**	**6.2%**
10 Year Expected Return (Geometric)	**6.0%**	**6.0%**	**6.2%**	**5.7%**
Standard Deviation	**12.2%**	**11.1%**	**12.2%**	**10.2%**
Sharpe Ratio	**0.47**	**0.50**	**0.49**	**0.51**
20 Year Expected Return (Arithmetic)	**7.6%**	**7.4%**	**7.8%**	**7.1%**
20 Year Expected Return (Geometric)	**6.9%**	**6.9%**	**7.1%**	**6.6%**

- All of the alternative portfolios present some risk/reward advantage over the current (policy) portfolio by investing more illiquid asset classes (namely, Private Credit)
- Alternative **Mix 1** the same return as the policy portfolio but with less volatility
- Alternative **Mix 2** has the same volatility as the policy portfolio but with more return
- Alternative **Mix 3** is a lower risk alternative that is still consistent with the actuarial rate of return assumption

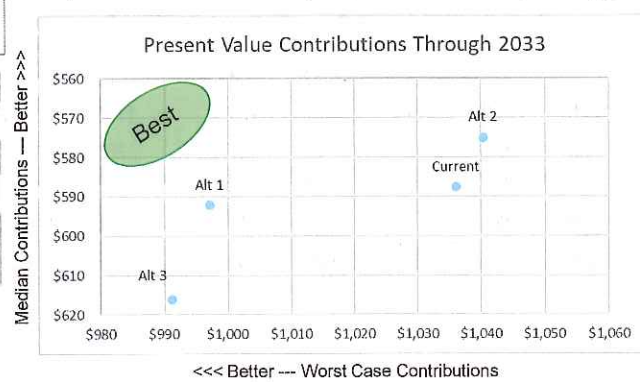
Stochastic Projections – Alternative Portfolios

Present Value of ER Contributions



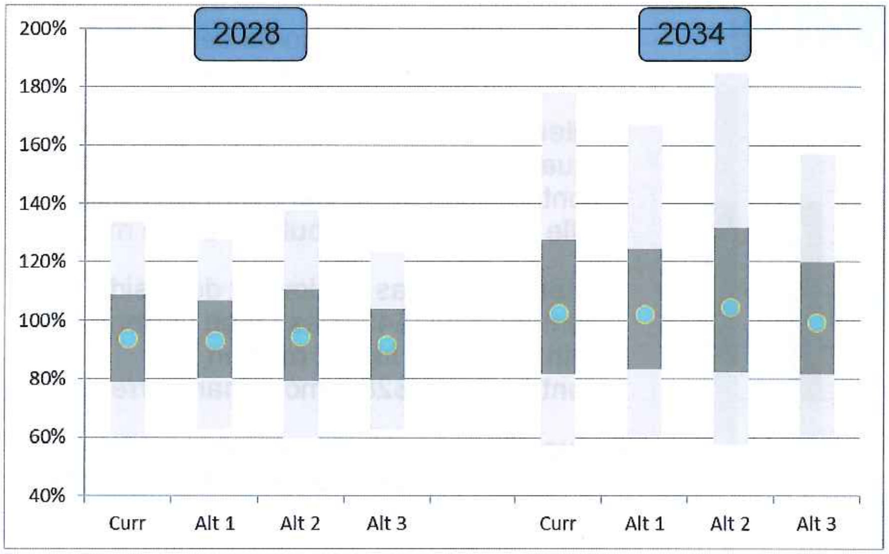
	Curr	Alt 1	Alt 2	Alt 3	Curr	Alt 1	Alt 2	Alt 3
95th	**564**	**547**	**566**	**543**	**1,036**	**997**	**1,040**	**991**
75th	452	448	452	449	782	768	780	779
50th	**386**	**389**	**382**	**395**	**588**	**592**	**575**	**616**
25th	320	331	313	341	407	433	392	464
5th	244	261	237	278	257	279	247	302

- All Portfolios provide some benefit compared with the current portfolio
- Alternative 1 is most compelling (quantitatively) as it reduces downside contributions by almost $40m with very little increased contributions at the median
- Alternative 3 has the lowest downside contributions ($45m less than current), but with materially higher median contributions ($28m more than current)
- Quantitative analysis cannot measure qualitative factors (i.e., added complexity)



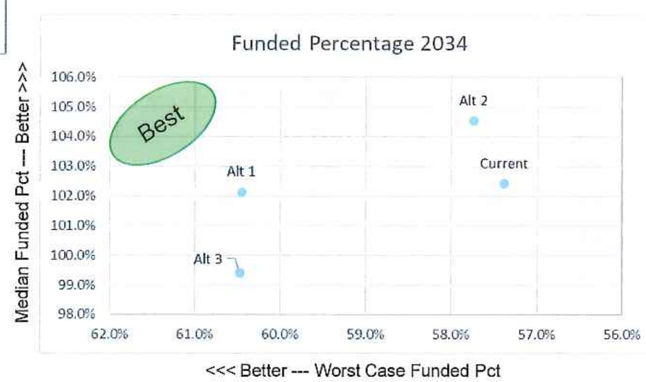
Stochastic Projections – Alternative Portfolios

Funded Percentage



	Curr	Alt 1	Alt 2	Alt 3	Curr	Alt 1	Alt 2	Alt 3
95th	134%	128%	138%	123%	178%	167%	185%	157%
75th	109%	107%	111%	104%	128%	124%	132%	120%
50th	**94%**	**93%**	**94%**	**92%**	**102%**	**102%**	**105%**	**99%**
25th	79%	80%	79%	79%	82%	83%	82%	82%
5th	**60%**	**63%**	**60%**	**63%**	**57%**	**60%**	**58%**	**60%**

- All Portfolios provide some benefit compared with the current portfolio
- Results are similar to prior slide (contributions) with Alternative 1 looking the most compelling quantitatively
- Alternative 2 improves both median results and downside results



Conclusion / Recommendations

- Current portfolio meets objectives
- Changes are possible at the margin provide positive risk-reward tradeoffs
- Window open to consider illiquid investments before 2034
- Private credit is a more opaque asset class (similar to private equity), education and implementation is key
  - Implementation includes manager selection, product selection, research, vintage year diversification, etc…

APPENDIX

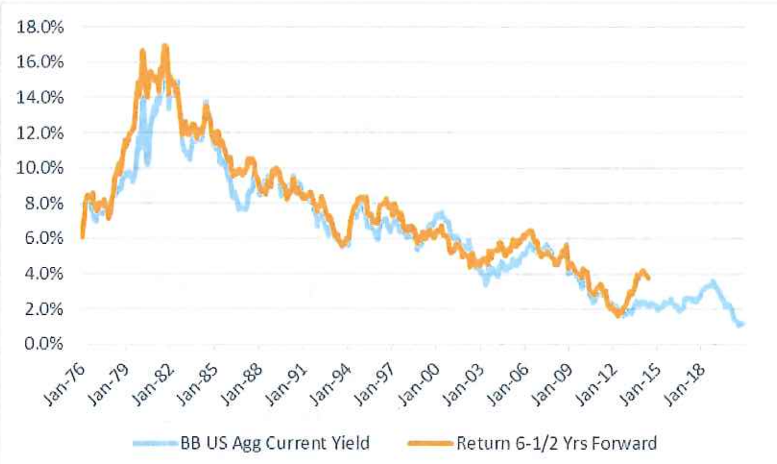
Projection of Liabilities
Capital Market Assumptions

Projected Liabilities

Estimated Rollforward Liability Projections				
Year	**PVB**	**EAN AAL**	**Payroll**	**Benefits**
2021	3,403,877,879	2,681,184,069	249,159,310	132,819,504
2022	3,521,606,142	2,782,310,422	254,640,815	124,884,924
2023	3,656,308,140	2,899,794,151	260,242,913	144,732,100
2024	3,780,362,054	3,006,065,544	265,968,257	152,286,597
2025	3,905,742,670	3,113,087,092	271,819,558	165,194,782
2026	4,026,975,329	3,215,402,266	277,799,589	173,975,089
2027	4,148,033,430	3,316,981,857	283,911,180	182,664,676
2028	4,268,990,917	3,417,897,129	290,157,226	191,468,014
2029	4,389,714,774	3,518,013,478	296,540,685	200,053,305
2030	4,510,407,054	3,617,530,701	303,064,580	209,026,944
2031	4,630,654,610	3,716,036,061	309,732,000	217,874,972
2032	4,750,547,781	3,813,620,401	316,546,104	227,363,482
2033	4,869,387,404	3,909,589,428	323,510,119	238,011,446
2034	4,985,882,775	4,002,665,057	330,627,341	248,317,311
2035	5,100,207,837	4,093,034,214	337,901,143	259,993,408
2036	5,210,769,985	4,179,127,025	345,334,968	272,244,449
2037	5,316,684,777	4,260,088,302	352,932,337	284,008,735
2038	5,418,105,752	4,336,102,321	360,696,849	296,900,965
2039	5,513,520,212	4,405,697,368	368,632,179	308,653,711
2040	5,603,659,805	4,469,645,319	376,742,087	321,594,520

- Estimated liability projections are based on plan design work done previously by Segal in August of 2021, but adjusted to account for the change in the discount rate assumption to 6.9%
- These estimates, and the projected costs based on these estimates, should not be relied upon other than for the purpose of comparing alternative asset allocations
- If more precise projections are needed (for instance for budgeting purposes) they would need to be supplied by the system's actuary (G.S. Curran & Company)

U.S. Core Fixed Income



- Current yield is a very good predictor of core fixed income returns ~6-7 years forward
- Yield on Bloomberg Barclays US Aggregate Bond Index at November 2020 is ~1.2%
- 2021 CMA cash return is of 0.6% for a 6-7 year horizon
- Plus a **proposed risk premium of 0.6%** (10bps higher than last year) would imply a 6-7 year forward return for US core fixed income of 1.3% (in-line with current yield)

2020 CMA

Government Securities	
Duration Compensation	0.10%
Share	0.45
Total Premium	0.05%
Non Government Securities	
Duration Compensation	0.10%
Average IG Spread	1.08%
Fraction Spread Earned	0.75
Avg Spread Earned	0.81%
Subtotal	0.91%
Share	0.55
Total Premium	0.50%
Risk Premium	**0.54%**
Assumed	0.50%

2021 CMA

Government Securities	
Duration Compensation	0.10%
Share	0.45
Total Premium	0.05%
Non Government Securities	
Duration Compensation	0.10%
Average IG Spread	1.25%
Fraction Spread Earned	0.70
Avg Spread Earned	0.88%
Subtotal	0.98%
Share	0.55
Total Premium	0.54%
Risk Premium	**0.58%**
Assumed	0.60%

Equity Building Blocks – U.S. Large Cap Equity

Historical Annualized Return (Nov/Nov)	90 Day T-Bills	S&P 500 (US Large Cap Equity)	Premium	Realized Volatility (Annual)
1980-2020	4.3%	11.3%	7.0%	15.0%
1990-2020	2.6%	10.7%	8.1%	14.6%
2000-2020	1.5%	7.3%	5.8%	15.0%
2010-2020	0.6%	14.2%	13.6%	13.6%
2021 CMA Long-term				
20-yr horizon	1.9%	6.9%	5.0%	18.0%

- Our equity risk premium is conservative compared to realized risk premiums over historical periods
  - Inflation and dividend yields are lower than historical averages
  - Valuations higher than historical average
  - Projected real GDP growth muted
- Current implied volatility for long-dated at-the-money S&P500 options is about 21% - directionally, an increase to last year's volatility assumption (of 17%) seems appropriate

Inflation		Dividend Yield		Real Earnings Growth		Valuation Adjustment		Long-term Compound Return
2.1%	*	1.9%	*	2.9%	*	-0.1%	~	6.9%

- 6.9% long-term median return with 18.0% annual volatility implies a mean annualized **arithmetic return of 8.4%**
- With long-term cash assumption of 1.9%, the implied arithmetic risk premium for US large cap equity is 6.50% (a 100bps increase over last year)
- Expected long-term returns for US Large Cap Equity up ~25bps (arithmetic), and ~10bps (geometric) year-over-year

Private Core Real Estate

- Overall impact of the Pandemic to private real estate as a whole has not been as bad as initially expected, however some sectors have been disproportionately affected
  - Retail and lodging sectors suffered the biggest declines, outlook for both sectors remains challenging over the shorter term
  - Industrial and apartments have been more resilient, with valuations for the most part holding up, particularly for industrial
  - Office real estate faces the greatest uncertainty as work-from-home may remain
- Outside retail and lodging, little evidence of a widespread 'COVID discount' due to limited transaction volume
  - Conversely, there is even some talk of a 'Covid premium' for industrial assets.
- On balance, risk premium for core real estate to remain the same as last year, nominal return expectations lower in line with reduction to risk free rate

Core Real Estate	Total Return	Income	Appreciation
2020 Nominal Rtn Assumption	*6.50%*	*4.50%*	*2.00%*
2021 Nominal Rtn Assumption	**5.75%**	**4.00%**	**1.75%**
2021 Cash	1.90%		
2021 Risk Premium	3.85%		

Private Equity 2021 CMA – Risk Premium

Private Equity Assumptions	5-10yrs Ago	2020	2021
US Large Cap Equity Risk Premium	5.50%	5.50%	6.50%
Risk Premium over L.C. Equity	5.00%	4.25%	4.25%
Total PE Risk Premium	**10.50%**	**9.75%**	**10.75%**
Liquidity Premium	2.50%	1.75%	1.75%
PE Risk Premium Less Liquidity Premium (Value Added Operational / Fin Eng)	2.50%	2.50%	2.50%
Risk Premium over L.C. Equity	**5.00%**	**4.25%**	**4.25%**

- Expected returns over US Large Cap equity remain the same
- Nominal returns are up year-over-year in-line with increased expectations for US Equity

Asset Class Assumptions (20yr)

Asset Class	Index Proxy	Arithmetic Return	Compound Return	Standard Deviation
Fixed Income				
Cash	90 Day U.S. Treasury Bill	1.9%	1.9%	2.0%
Stable Value	Hueler Stable Value	2.0%	2.0%	2.0%
Short Duration	Bloomberg Barclays 1-5 Year Govt/Credit	2.0%	2.0%	3.0%
Intermediate Duration	Bloomberg Barclays Intermediate Govt/Credit	2.0%	2.0%	4.0%
TIPS	Bloomberg Barclays TIPS Index	2.6%	2.4%	5.8%
Core Fixed Income	Bloomberg Barclays U.S. Aggregate Index	2.5%	2.4%	5.0%
Developed Markets Fixed Income	Citigroup Non-U.S. World Gov't Bond (Unhedged)	2.2%	1.8%	9.5%
Bank Loans	Credit Suisse Leveraged Loan	4.4%	4.1%	7.5%
High Yield	Citigroup High Yield Market	5.2%	4.8%	9.5%
Emerging Market Debt (50% LC)	50% JPM EMBI / 50% JPM GBI	5.4%	4.8%	11.5%
Global Fixed Income (Unhedged)	Bloomberg Barclays Global Aggregate (Unhedged)	2.6%	2.3%	7.1%
Long-Term Fixed Income	Bloomberg Barclays U.S. Long Govt/Credit	2.5%	1.9%	11.0%
Municipal Bonds	Bloomberg Barclays Municipal Bond	3.4%	3.2%	5.8%
Equity				
US Equity	Russell 3000	8.6%	7.1%	18.6%
Large Cap	S&P 500	8.4%	6.9%	18.0%
Mid Cap	Russell Mid Cap	9.1%	7.3%	20.0%
Small Cap	Russell 2000	9.5%	7.0%	23.5%
Developed Equity (Unhedged)	MSCI EAFE (Unhedged)	9.4%	7.6%	20.0%
International Small Cap	MSCI EAFE Small Cap	10.5%	8.0%	23.5%
Emerging Markets Equity	S&P / Intl Finance Corp Investable Composite	11.3%	8.6%	25.0%
Global Equity (Unhedged)	MSCI World (Unhedged)	8.9%	7.4%	18.4%
Global REITS	FTSE EPRA Nareit Global	7.4%	5.9%	18.2%

Asset Class Assumptions (20yr)

Asset Class	Index Proxy	Arithmetic Return	Compound Return	Standard Deviation
Alternatives				
Multi-Asset Class Solutions (MACS)	MACS Custom Index	5.6%	5.3%	8.5%
Private Equity	Venture Economics – All Private Equity	12.6%	10.2%	23.5%
Private Credit	S&P / LSTA Middle Market Index	7.9%	7.5%	9.0%
Hedge Fund of Funds	HFRI Fund of Funds Composite	4.5%	4.4%	6.3%
Hedge Funds – Equity Long/Short	HFRI Equity Hedge (Total) Index	6.4%	5.8%	11.4%
Hedge Funds – Credit Event Driven	50% HFRI Event Driven / 50% HFRI Relative Value	5.3%	5.1%	7.8%
Hedge Funds – Global Macro	HFRI Macro	3.9%	3.7%	6.0%
Hedge Funds – Activist	HFRX Activist	6.1%	5.5%	12.0%
Hedge Funds – Opportunistic	HFRI Fund of Funds Composite	6.6%	6.2%	9.5%
Real Assets				
Commodities	Bloomberg Commodity Index	5.7%	3.8%	20.0%
Real Estate – Core	NCREIF Property Index	5.7%	5.0%	12.5%
Real Estate – Value Add	StepStone Real Estate – Value	8.7%	7.6%	15.5%
Real Estate – Opportunistic	StepStone Real Estate - Opportunistic	11.1%	9.6%	18.5%
Real Estate Debt	Bloomberg Barclays CMBS IG	4.2%	3.9%	7.5%
Timber	NCREIF Timberland	5.8%	5.3%	9.8%
Farmland	NCREIF Farmland	7.8%	7.0%	13.2%
Oil & Gas	S&P Oil & Gas Exploration & Production Select Industry	12.2%	8.4%	30.0%
Infrastructure	FTSE Global Core Infrastructure 50/50 Index	7.8%	7.0%	13.5%

Asset Class Assumptions (10yr)

Asset Class	Index Proxy	Arithmetic Return	Compound Return	Standard Deviation
Fixed Income				
Cash	90 Day U.S. Treasury Bill	1.0%	1.0%	2.0%
Stable Value	Hueler Stable Value	1.1%	1.1%	2.0%
Short Duration	Bloomberg Barclays 1-5 Year Govt/Credit	1.1%	1.1%	3.0%
Intermediate Duration	Bloomberg Barclays Intermediate Govt/Credit	1.2%	1.1%	4.0%
TIPS	Bloomberg Barclays TIPS Index	1.7%	1.5%	5.8%
Core Fixed Income	Bloomberg Barclays U.S. Aggregate Index	1.6%	1.5%	5.0%
Developed Markets Fixed Income	Citigroup Non-U.S. World Gov't Bond (Unhedged)	1.3%	0.9%	9.5%
Bank Loans	Credit Suisse Leveraged Loan	3.5%	3.2%	7.5%
High Yield	Citigroup High Yield Market	4.3%	3.9%	9.5%
Emerging Market Debt (50% LC)	50% JPM EMBI / 50% JPM GBI	4.5%	3.9%	11.5%
Global Fixed Income (Unhedged)	Bloomberg Barclays Global Aggregate (Unhedged)	1.7%	1.5%	7.1%
Long-Term Fixed Income	Bloomberg Barclays U.S. Long Govt/Credit	1.6%	1.0%	11.0%
Municipal Bonds	Bloomberg Barclays Municipal Bond	2.8%	2.6%	5.8%
Equity				
US Equity	Russell 3000	7.8%	6.2%	18.6%
Large Cap	S&P 500	7.5%	6.0%	18.0%
Mid Cap	Russell Mid Cap	8.2%	6.4%	20.0%
Small Cap	Russell 2000	8.6%	6.2%	23.5%
Developed Equity (Unhedged)	MSCI EAFE (Unhedged)	8.5%	6.7%	20.0%
International Small Cap	MSCI EAFE Small Cap	9.6%	7.2%	23.5%
Emerging Markets Equity	S&P / Intl Finance Corp Investable Composite	10.4%	7.7%	25.0%
Global Equity (Unhedged)	MSCI World (Unhedged)	8.0%	6.5%	18.4%
Global REITS	FTSE EPRA Nareit Global	6.5%	5.0%	18.2%

Disclaimer
All numbers represent Segal Marco Advisors' forward looking asset class assumptions, and as such, reflect estimates as of a certain date. These assumptions are not a guarantee of future performance, do reflect high levels of uncertainty and are subject to change without notice.

Asset Class Assumptions (10yr)

Asset Class	Index Proxy	Arithmetic Return	Compound Return	Standard Deviation
Alternatives				
Multi-Asset Class Solutions (MACS)	MACS Custom Index	4.8%	4.4%	8.5%
Private Equity	Venture Economics – All Private Equity	11.8%	9.4%	23.5%
Private Credit	S&P / LSTA Middle Market Index	7.0%	6.6%	9.0%
Hedge Fund of Funds	HFRI Fund of Funds Composite	3.7%	3.5%	6.3%
Hedge Funds – Equity Long/Short	HFRI Equity Hedge (Total) Index	5.5%	4.9%	11.4%
Hedge Funds – Credit Event Driven	50% HFRI Event Driven / 50% HFRI Relative Value	4.5%	4.2%	7.8%
Hedge Funds – Global Macro	HFRI Macro	3.0%	2.8%	6.0%
Hedge Funds – Activist	HFRX Activist	5.3%	4.6%	12.0%
Hedge Funds – Opportunistic	HFRI Fund of Funds Composite	5.8%	5.3%	9.5%
Real Assets				
Commodities	Bloomberg Commodity Index	4.8%	3.0%	20.0%
Real Estate – Core	NCREIF Property Index	4.9%	4.1%	12.5%
Real Estate – Value Add	StepStone Real Estate – Value	7.8%	6.7%	15.5%
Real Estate – Opportunistic	StepStone Real Estate - Opportunistic	10.2%	8.7%	18.5%
Real Estate Debt	Bloomberg Barclays CMBS IG	3.3%	3.0%	7.5%
Timber	NCREIF Timberland	4.9%	4.5%	9.8%
Farmland	NCREIF Farmland	6.9%	6.1%	13.2%
Oil & Gas	S&P Oil & Gas Exploration & Production Select Industry	11.4%	7.5%	30.0%
Infrastructure	FTSE Global Core Infrastructure 50/50 Index	7.0%	6.1%	13.5%

Disclaimer
All numbers represent Segal Marco Advisors' forward looking asset class assumptions, and as such, reflect estimates as of a certain date. These assumptions are not a guarantee of future performance, do reflect high levels of uncertainty and are subject to change without notice.