Board of Trustees

Special Meeting

March 05, 2020

Table of Contents

01 Agenda

APFC ALASKA PERMANENT FUND CORPORATION
801 W 10TH SUITE 302 | JUNEAU, AK 99801
907.796.1500 | apfc.org

SPECIAL MEETING OF THE BOARD OF TRUSTEES
Telephonic

March 05, 2020
2:30-3:30pm

Webinar Access (click link to join webinar)
Join via WebEx and enjoy the ability to listen on your computer and follow presentations:
https://apfc.webex.com/apfc/onstage/g.php?MTID=e02d156e544fb36fbd10c5984f2f24959
Event Password: 03052020

Teleconference Option
If you are unable to join in-person or via webinar, please contact us at (907) 796-1500 to receive a teleconference number.

AGENDA

WEDNESDAY, FEBRUARY 19, 2020

2:30 p.m.	CALL TO ORDER
	ROLL CALL (Action)
	APPROVAL OF AGENDA (Action)
	SCHEDULED APPEARANCES AND PUBLIC PARTICIPATION
02:35 p.m.	EARNINGS RESERVE ACCOUNT RESOLUTION (Action)
3:25 p.m.	TRUSTEE COMMENTS FUTURE AGENDA ITEMS
3:30 p.m.	ADJOURNMENT

02 Proposed Resolution

Alaska Permanent Fund Corporation

RESOLUTION OF THE BOARD OF TRUSTEES OF THE ALASKA PERMANENT FUND CORPORATION OFFERING ALTERNATE PROPOSALS TO SUPPORT AN ANNUAL PERCENT OF MARKET VALUE DRAW FROM THE PERMANENT FUND

RESOLUTION 20-01

With the enactment of SB 26, Chapter 16 SLA 18 on July 1, 2018, an essential step was taken to codify a set of rules to establish a sustainable annual draw from the realized earnings of the Alaska Permanent Fund (Fund). The Board of Trustees believes additional measures would enhance the sustainable use of Fund earnings for the benefit of all generations of Alaskans that warrant consideration by the Alaska Legislature and the Administration, including:

1. **Transform, by constitutional or statutory amendment, the Alaska Permanent Fund and Earnings Reserve Account into a single fund and limit the annual draw to the fund's long-term real return:**

   a. **Constitutional Amendment:** On three prior occasions the Board has adopted a resolution (Resolutions 00-13, 03-05, and 04-09) to collapse the Earnings Reserve Account into the Principal of the Fund and limit the annual draw from the combined Fund to no more than five percent of the average fiscal year-end market value of the fund over the immediately preceding five years. These resolutions explained that limiting the Fund's annual draw to the average real return of the Fund was both: (1) a common practice among large endowment funds, and (2) an effective way to balance the goal of maximizing the availability of income with the long-term goal of protecting the purchasing power of the Fund. Constitutional amendments to advance this change were considered by the Alaska Legislature during the Twenty-Second and Twenty-Third Alaska Legislatures, and are currently being considered by the Thirty-First session of the Alaska Legislature. To date, none of these resolutions have received sufficient Legislative support to advance to a general election for consideration by Alaska voters. The Board, through this Resolution, expresses its continued support of a constitutional amendment along the parameters outlined in its three prior resolutions on this topic.

   b. **Statutory Amendment:** The Board has also discussed and supports the development of a legislative proposal that would amend existing law to transform the current two-fund structure (i.e. Principal and ERA) into a single fund with an annual appropriation to the General Fund based on the average long-term real return of the Fund. Because

the constitutionally dedicated royalty deposits and appropriations to the Principal of the Fund are not subject to appropriation (i.e., permanent dedications), an annual appropriation would be prohibited if it would cause the value of the Fund to drop below the historic dollar value of these dedicated deposits. By collapsing the ERA and Principal into a single fund and limiting the annual draw to the Fund's real return, inflation-proofing the Fund on an annual basis via annual appropriation would no longer be necessary. Importantly, this single fund transformation, based on the words contained in article IX, section 15 of the Alaska Constitution, appears supported by the rules of construction in section 4 of the Uniform Prudent Management of Institutional Funds Act, which Alaska enacted in 2010. The Board, through this Resolution, expresses its support for and directs APFC Staff to draft a legislative proposal and seek input from the Department of Law before submitting this proposal to the Administration and Legislature for their consideration.

2. **Adjustments to the existing rules-based system governing fund transfers into and out of the Principal and ERA, if the ERA and Principal are not combined:** If sufficient support for a constitutional or statutory amendment cannot be garnered to transform the Principal and ERA into a single fund with a limited annual draw, the Board supports the following additions to the existing rules-based system to ensure the ERA balance is sufficient to meet the annual POMV draw enacted by the Legislature in SB 26:

   a. **Periodic Review of Fund Return Assumption:** Because the POMV draw from the ERA established in SB 26 is based on the assumption that the Fund expects to generate an average real return of 5%, if the Fund's real return falls below 5% for an extended period of time, the ERA will run dry (i.e. ERA Shortfall). The Board recommends having a mechanism built into state law that would require APFC to revisit this return assumption every few years and provide the Legislature with a report as to whether a 5% POMV is projected to be sustainable, both in terms of the expectation of the Fund to generate a 5% real return and the ERA's ability to support the POMV draw based upon its current and projected balance.

   b. **ERA Balance Buffer:** In modeling and analyzing the long-term durability of the ERA to support the POMV draw, it is clear that during market environments when realized gains from the Principal remain low for a prolonged period of time, without a buffer of funds in the ERA, the risk of ERA Shortfalls become meaningful. To hedge this risk, the Board supports a change to the existing rules-based system to maintain a balance in the ERA of at least four times the expected annual POMV draw ("4X Buffer"). This would include a rules-based approach that suspends inflation proofing when the ERA

balance is below the 4X Buffer, and to makes up missed inflation proofing payments when the ERA balance exceeds the 4X Buffer. This set of rules is projected to result in similar inflation proofing outcomes as the current annual rule, but significantly decrease the chance the POMV draw cannot be made in any given year.

To be clear, the Board continues to support the consistent inflation-proofing of the Principal of the Fund as set forth in Board Resolutions 17-01 and 18-04. However, if the Legislature can both maintain the long-term durability of the ERA to support the SB 26 annual POMV draw and honor its commitment to inflation-proof the Principal of the Fund over the long-term, the harm to the Principal of the Fund will be mitigated. The Board is also evaluating and discussing with the Department of Law a legislative proposal to re-define "net income" so that the annual inflation-proofing transfer would happen every year automatically. Should this legislative proposal receive support, it could be designed to trigger the suspension of inflation-proofing when the ERA balance is too low and trigger inflation-proofing catch-up payments when the balance of the ERA recovers; all without the need for annual appropriation to support these events.

Based on analysis completed by APFC Staff at the request of the Board, the combination of these two protective measures will enhance the ability of the ERA to weather most foreseeable market environments and sustainably generate the 5% POMV draw set forth in SB 26.

NOW THEREFORE BE IT RESOLVED that the Trustees direct the Executive Director to distribute this Resolution to the Members of the 31st Alaska State Legislature and offer to have the Board testify in support of the Legislative initiatives set forth in this Resolution.

PASSED AND APPROVED by the Board of Trustees if the Alaska Permanent Fund Corporation, this ___ day of _____, 2020.

/s/
Craig Richards
Chairman, Board of Trustees
Alaska Permanent Fund Corporation

ATTEST:

/s/
Angela M. Rodell, Corporate Secretary

03 APFC Fund Modeling Overview

APFC Total Fund & ERA Model

February 19-20, 2020

Summary of Modeling Exercise

Assumptions & Methodology

- **Inflation:** In historical capital markets scenarios use actual inflation from periods; 2.25% inflation rate in 7.00% flat return case
- **APFC Portfolio Turnover Rate:** 20%
- **Inflation Proofing:** Yes, in base-line model, assumed for all periods for which Realized Earnings are available after paying POMV (including FY 2021-2024)
- **Assignment of Statutory Net Income:** If positive for a full fiscal year, 100% assigned to ERA; If negative for a full fiscal year, Statutory Net Income from ERA balances remains in the ERA, Statutory Net Income from Principal balances remains in the Principal
- **Accounting Net Income:** Accounting Net Income assumed to approximate total fund return (applied to beginning fund balance minus 50% of POMV transfer amount for mid-year convention)
- **Beginning Model Balances:** Fund balances for beginning amounts sourced from "History & Projections" file's projected levels for June 30, 2020 (including $4 billion appropriation from ERA to Principal occurring in FY 2020)
- **Baseline Realized Income:** 2.5% of Total Fund (Beginning Value) for any given year

Capital Markets Scenarios

- For purposes of modeling a wide range of capital markets expectations for the APFC's Fund portfolio returns, eleven discrete projection cases based on historical capital markets environments were used plus a case with 7.00% static annual returns and 2.25% static inflation

- This approach is different than Callan's Monte Carlo simulation approach; the benefit of the Monte Carlo approach is that one can run many thousands of simulations and the benefit of running a discrete number of projection cases is the reader can more fully grasp what is happening in the different scenarios (i.e., "1970's Capital Market Environment" vs. "95% Tail Risk Scenario")
  - Monte Carlo models also may suffer from many of the same shortcomings of other statistical analyses such as assuming a normal distribution of outcomes or other outcome distribution assumptions that may not fully capture "fat tails"

- Capital Market Scenarios (essentially twenty year forecasts for Total Fund Annual Returns) includes the following approaches:
  - **Flat Annual Return Assumption (1 Scenario):** Assumes that the Fund earns the flat 7.00% with 2.25% inflation in-line with History & Projections file
  - **Periods 1900's through 2010's (11 Scenarios):** These eleven scenarios take the total returns on a portfolio 70% invested in domestic stocks and 30% invested in domestic fixed income with annual rebalancing and applies its annual returns for each twenty year period starting in 1900 and each subsequent decade start; modeled inflation is the actual CPI experienced in these time periods

Capital Markets Scenarios (continued)

The table below provides a summary of average returns of domestic stocks, domestic fixed income, and a 70/30 portfolio going back to 1900; given the emphasis on looking at portfolio returns in these past periods (by decade) an upfront summary can be helpful to orient the reader

	1900's	1910's	1920's	1930's	1940's	1950's	1960's	1970's	1980's	1990's	2000's	2010's	Long-Term Average [1]
Average Annual Return on Domestic Stocks	11.91%	5.85%	16.05%	5.48%	9.98%	21.98%	8.68%	7.46%	18.19%	18.99%	1.21%	14.15%	11.66%
Average Annual Return on Domestic Fixed Income	5.24%	5.27%	3.75%	4.01%	2.52%	0.83%	2.51%	6.44%	12.76%	7.88%	6.37%	3.80%	5.11%
Average Annual Return on 70/30 Portfolio	**9.91%**	**5.67%**	**12.36%**	**5.04%**	**7.74%**	**15.64%**	**6.83%**	**7.15%**	**16.56%**	**15.66%**	**2.76%**	**11.05%**	**9.70%**
Average Annual Inflation (CPI)	2.50%	6.94%	(0.86%)	(1.92%)	5.51%	2.24%	2.53%	7.41%	5.14%	2.94%	2.53%	1.76%	3.06%
Average Real Return	**7.41%**	**(1.27%)**	**13.22%**	**6.96%**	**2.23%**	**13.39%**	**4.30%**	**(0.26%)**	**11.42%**	**12.72%**	**0.23%**	**9.28%**	**6.64%**

1. Represents the simple average of the columns to the left, which, themselves, are the simple average of the annual returns or average annual inflation in each decade.
Source: Analysis from APFC Investments Department.

Capital Markets Scenarios (continued)

	Year 1 FY 2021	Year 2 FY 2022	Year 3 FY 2023	Year 4 FY 2024	Year 5 FY 2025	Year 6 FY 2026	Year 7 FY 2027	Year 8 FY 2028	Year 9 FY 2029	Year 10 FY 2030	Average Year 11-20 FY '31-'40	Average Full 20 Yr. Projection
1900-1919 - 70/30	14.04%	15.73%	5.33%	(8.42%)	23.17%	15.11%	6.14%	(18.91%)	32.40%	14.47%	5.67%	7.79%
1910-1929 - 70/30	(3.96%)	5.67%	7.28%	(4.80%)	(0.19%)	25.87%	7.06%	(15.91%)	20.00%	15.72%	12.36%	9.02%
1920-1939 - 70/30	(10.77%)	11.87%	19.82%	3.43%	18.57%	20.54%	10.17%	25.30%	26.15%	(1.46%)	5.04%	8.70%
1930-1949 - 70/30	(14.73%)	(28.25%)	(4.00%)	38.02%	0.49%	33.32%	25.61%	(23.90%)	22.80%	1.06%	7.74%	6.39%
1940-1959 - 70/30	(5.22%)	(8.72%)	14.79%	18.69%	12.99%	26.56%	(4.68%)	4.22%	4.34%	14.42%	15.64%	11.69%
1950-1969 - 70/30	22.15%	16.69%	13.39%	0.58%	37.58%	21.58%	3.86%	(5.46%)	29.57%	16.40%	6.83%	11.23%
1960-1979 - 70/30	3.81%	19.43%	(4.36%)	16.44%	12.62%	8.94%	(6.14%)	16.25%	8.71%	(7.39%)	7.15%	6.99%
1970-1989 - 70/30	7.34%	12.95%	14.14%	(9.18%)	(18.83%)	29.43%	21.18%	(4.10%)	5.02%	13.61%	16.56%	11.86%
1980-1999 - 70/30	23.56%	(1.57%)	24.87%	18.30%	8.94%	28.84%	17.64%	4.50%	13.99%	26.54%	15.66%	16.11%
1990-2009 - 70/30	0.52%	26.13%	7.55%	9.98%	0.05%	31.85%	17.16%	26.25%	22.61%	14.48%	2.76%	9.21%
2000-2019 - 70/30	(2.89%)	(5.79%)	(12.39%)	21.31%	8.92%	4.17%	12.36%	5.94%	(24.33%)	20.30%	11.05%	6.90%
Flat 7.00% & 2.25%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%

POMV Shortfall Analysis

Base Case – Principal Allocated the Same as ERA

- Baseline POMV / ERA combination is not particularly stable with 7 out of 11 historical capital markets scenarios failing to fulfill POMV payments to General Fund over twenty year horizon

($ in millions)	**Base Case**						
	Shortfall Year	**Initial Shortfall**	**Cum. Shortfall**	**Worst % Shortfall**	**# Shortfall Years**	**Cum. Infl. SF**	**Ending Fund Value**
1 = "1900-1919 - 70/30"	FY 2036	($2,345)	($5,189)	58%	2.00	$41,980	$114,731
2 = "1910-1929 - 70/30"	FY 2026	($1,774)	($5,140)	66%	4.00	$21,334	$160,712
3 = "1920-1939 - 70/30"	N/A	$0	$0	0%	0.00	$0	$106,995
4 = "1930-1949 - 70/30"	FY 2024	($820)	($8,346)	96%	5.00	$8,529	$84,731
5 = "1940-1959 - 70/30"	FY 2024	($992)	($992)	32%	1.00	$15,106	$253,550
6 = "1950-1969 - 70/30"	N/A	$0	$0	0%	0.00	$0	$232,331
7 = "1960-1979 - 70/30"	FY 2035	($495)	($6,249)	100%	3.00	$44,264	$104,141
8 = "1970-1989 - 70/30"	FY 2026	($3,667)	($4,188)	100%	2.00	$37,902	$270,694
9 = "1980-1999 - 70/30"	N/A	$0	$0	0%	0.00	$0	$614,268
10 = "1990-2009 - 70/30"	N/A	$0	$0	0%	0.00	$0	$141,518
11 = "2000-2019 - 70/30"	FY 2024	($686)	($8,005)	90%	8.00	$12,829	$110,352
12 = "Flat 7.00% & 2.25%"	N/A	$0	$0	0%	0.00	$0	$111,981
Average (Cases 1-11)		($980)	($3,464)	49%	2.27	$16,540	$199,457

POMV Shortfall Analysis

Base Case – Fund Allocation Shifted with Total Allocation Same, More FI in ERA

- Although "shifting" the APFC allocation for the ERA more into Fixed Income (while leaving Total Fund allocation unchanged) has some theoretical benefit, in the eleven cases examined here (using the Base Case) there was no material benefit to doing so
- In past versions of this analysis there were cases that made it through under this approach (e.g., APFC – GFC Scenario), however, none remain at this point; in the difficult cases the ERA is reduced rapidly to a point where changing ERA allocation makes little difference
- As demonstrated later in these materials, however, there is a benefit to shifting the asset allocation when combined with methods to ensure a minimum ERA size (e.g., 4x Rule); when minimum ERA sizes are not assured, stress scenarios results in dwindling ERA sizes with little benefit of shifting its asset mix

($ in millions)	**Base Case**						
	Shortfall Year	**Initial Shortfall**	**Cum. Shortfall**	**Worst % Shortfall**	**# Shortfall Years**	**Cum. Infl. SF**	**Ending Fund Value**
1 = "1900-1919 - 70/30"	FY 2036	($1,704)	($4,930)	61%	3.00	$41,851	$114,654
2 = "1910-1929 - 70/30"	FY 2026	($715)	($5,029)	71%	5.00	$21,583	$161,677
3 = "1920-1939 - 70/30"	N/A	$0	$0	0%	0.00	$0	$108,008
4 = "1930-1949 - 70/30"	FY 2025	($199)	($7,365)	100%	5.00	$7,451	$82,430
5 = "1940-1959 - 70/30"	FY 2024	($1,500)	($1,500)	48%	1.00	$14,314	$264,918
6 = "1950-1969 - 70/30"	N/A	$0	$0	0%	0.00	$0	$240,732
7 = "1960-1979 - 70/30"	FY 2035	($865)	($6,891)	100%	4.00	$43,556	$105,326
8 = "1970-1989 - 70/30"	FY 2026	($3,663)	($5,045)	100%	3.00	$37,000	$274,140
9 = "1980-1999 - 70/30"	N/A	$0	$0	0%	0.00	$0	$626,260
10 = "1990-2009 - 70/30"	N/A	$0	$0	0%	0.00	$0	$141,740
11 = "2000-2019 - 70/30"	FY 2025	($289)	($7,946)	92%	7.00	$11,877	$109,960
12 = "Flat 7.00% & 2.25%"	N/A	$0	$0	0%	0.00	$0	$113,892
			17				
Average (Cases 1-11)		($812)	($3,519)	52%	2.55	$16,148	$202,713

POMV Shortfall Analysis

4x POMV in ERA Inflation Proofing Approach (Asset Allocation Unchanged)

- The version of SB 26 that passed the House included a feature whereby the lessor of (i) excess amounts in the ERA (minus the POMV transfer amount) in excess of 4x of the POMV transfer amount and (ii) cumulative inflation proofing shortfall would be available to the Legislature to appropriate to Principal as inflation proofing
- The table below shows the outcome of the eleven operating cases forecasted for twenty years using this approach

($ in millions)	4x ERA Overage Inflation Proofing						
	Shortfall Year	**Initial Shortfall**	**Cum. Shortfall**	**Worst % Shortfall**	**# Shortfall Years**	**Cum. Infl. SF**	**Ending Fund Value**
1 = "1900-1919 - 70/30"	N/A	$0	$0	0%	0.00	$46,612	$108,017
2 = "1910-1929 - 70/30"	N/A	$0	$0	0%	0.00	$0	$146,744
3 = "1920-1939 - 70/30"	N/A	$0	$0	0%	0.00	$0	$106,995
4 = "1930-1949 - 70/30"	FY 2024	($820)	($6,094)	83%	5.00	$15,652	$80,687
5 = "1940-1959 - 70/30"	N/A	$0	$0	0%	0.00	$0	$249,191
6 = "1950-1969 - 70/30"	N/A	$0	$0	0%	0.00	$0	$232,331
7 = "1960-1979 - 70/30"	N/A	$0	$0	0%	0.00	$49,712	$95,160
8 = "1970-1989 - 70/30"	N/A	$0	$0	0%	0.00	$0	$251,758
9 = "1980-1999 - 70/30"	N/A	$0	$0	0%	0.00	$0	$614,268
10 = "1990-2009 - 70/30"	N/A	$0	$0	0%	0.00	$0	$141,518
11 = "2000-2019 - 70/30"	FY 2026	($253)	($5,340)	84%	6.00	$12,615	$105,194
12 = "Flat 7.00% & 2.25%"	N/A	$0	$0	0%	0.00	$5,946	$111,981
Average (Cases 1-11)		($98)	($1,039)	15%	1.00	$11,326	$193,806

POMV Shortfall Analysis

4x POMV in ERA Inflation Proofing Approach, AA Shifted – FI in ERA

- Neither of the two POMV shortfall scenarios from the prior page are avoided by shifting the Fund's asset allocation (ERA invested in Fixed Income, Principal in remaining higher risk/higher return assets); however, the cumulative POMV shortfalls are materially reduced and the year of initial POMV shortfall is delayed by two years and four years, respectively

($ in millions)	4x ERA Overage Inflation Proofing						
	Shortfall Year	**Initial Shortfall**	**Cum. Shortfall**	**Worst % Shortfall**	**# Shortfall Years**	**Cum. Infl. SF**	**Ending Fund Value**
1 = "1900-1919 - 70/30"	N/A	$0	$0	0%	0.00	$47,134	$108,819
2 = "1910-1929 - 70/30"	N/A	$0	$0	0%	0.00	$0	$148,773
3 = "1920-1939 - 70/30"	N/A	$0	$0	0%	0.00	$0	$108,008
4 = "1930-1949 - 70/30"	FY 2026	($2,036)	($4,900)	88%	3.00	$15,967	$78,074
5 = "1940-1959 - 70/30"	N/A	$0	$0	0%	0.00	$0	$258,630
6 = "1950-1969 - 70/30"	N/A	$0	$0	0%	0.00	$0	$240,732
7 = "1960-1979 - 70/30"	N/A	$0	$0	0%	0.00	$49,427	$95,911
8 = "1970-1989 - 70/30"	N/A	$0	$0	0%	0.00	$0	$253,283
9 = "1980-1999 - 70/30"	N/A	$0	$0	0%	0.00	$0	$626,260
10 = "1990-2009 - 70/30"	N/A	$0	$0	0%	0.00	$0	$141,740
11 = "2000-2019 - 70/30"	FY 2030	($1,997)	($4,781)	72%	4.00	$13,173	$104,043
12 = "Flat 7.00% & 2.25%"	N/A	$0	$0	0%	0.00	$6,842	$113,892
Average (Cases 1-11)		($367)	($880)	15%	0.64	$11,427	$196,752

4x POMV in ERA Rule Can Improve both POMV and Inflation Shortfalls

Cumulative POMV Shortfall

Case	Base Case	4x Rule	4x Rule, AA Shifted
1 = "1900-1919 - 70/30"	$5,189	$0	$0
2 = "1910-1929 - 70/30"	$5,140	$0	$0
3 = "1920-1939 - 70/30"	$0	$0	$0
4 = "1930-1949 - 70/30"	$8,346	$6,094	$4,900
5 = "1940-1959 - 70/30"	$992	$0	$0
6 = "1950-1969 - 70/30"	$0	$0	$0
7 = "1960-1979 - 70/30"	$6,249	$0	$0
8 = "1970-1989 - 70/30"	$4,188	$0	$0
9 = "1980-1999 - 70/30"	$0	$0	$0
10 = "1990-2009 - 70/30"	$0	$0	$0
11 = "2000-2019 - 70/30"	$8,005	$5,340	$4,781

Cumulative Inflation Shortfall

Case	Base Case	4x Rule	4x Rule, AA Shifted
1 = "1900-1919 - 70/30"	$41,980	$46,612	$47,134
2 = "1910-1929 - 70/30"	$21,334	$0	$0
3 = "1920-1939 - 70/30"	$0	$0	$0
4 = "1930-1949 - 70/30"	$8,529	$15,652	$15,967
5 = "1940-1959 - 70/30"	$15,106	$0	$0
6 = "1950-1969 - 70/30"	$0	$0	$0
7 = "1960-1979 - 70/30"	$44,264	$49,712	$49,427
8 = "1970-1989 - 70/30"	$37,902	$0	$0
9 = "1980-1999 - 70/30"	$0	$0	$0
10 = "1990-2009 - 70/30"	$0	$0	$0
11 = "2000-2019 - 70/30"	$12,829	$12,615	$13,173

4x Rule Sensitivity Analysis
With no Change to Asset Allocation

($ in millions)		Cumulative Shortfall (at Range of Minimum Multiples of POMV in ERA)						
	Base Case	**2.00x**	**2.50x**	**3.00x**	**3.50x**	**4.00x**	**4.50x**	**5.00x**
1 = "1900-1919 - 70/30"	($5,189)	$0	$0	$0	$0	$0	$0	$0
2 = "1910-1929 - 70/30"	($5,140)	($531)	($443)	$0	$0	$0	$0	$0
3 = "1920-1939 - 70/30"	$0	$0	$0	$0	$0	$0	$0	$0
4 = "1930-1949 - 70/30"	($8,346)	($8,007)	($8,007)	($7,557)	($6,741)	($6,094)	($6,094)	($6,094)
5 = "1940-1959 - 70/30"	($992)	$0	$0	$0	$0	$0	$0	$0
6 = "1950-1969 - 70/30"	$0	$0	$0	$0	$0	$0	$0	$0
7 = "1960-1979 - 70/30"	($6,249)	($3,449)	($1,693)	$0	$0	$0	$0	$0
8 = "1970-1989 - 70/30"	($4,188)	($906)	($906)	($724)	$0	$0	$0	$0
9 = "1980-1999 - 70/30"	$0	$0	$0	$0	$0	$0	$0	$0
10 = "1990-2009 - 70/30"	$0	$0	$0	$0	$0	$0	$0	$0
11 = "2000-2019 - 70/30"	($8,005)	($6,568)	($6,568)	($5,812)	($5,812)	($5,340)	($4,243)	($4,243)
12 = "Flat 7.00% & 2.25%"	$0	$0	$0	$0	$0	$0	$0	$0
Average (Cases 1-11)		($1,769)	($1,602)	($1,281)	($1,141)	($1,039)	($940)	($940)

4x Rule Sensitivity Analysis
With ERA Shifted into Fixed Income

($ in millions)		Cumulative Shortfall (at Range of Minimum Multiples of POMV in ERA)						
	Base Case	**2.00x**	**2.50x**	**3.00x**	**3.50x**	**4.00x**	**4.50x**	**5.00x**
1 = "1900-1919 - 70/30"	($4,930)	$0	$0	$0	$0	$0	$0	$0
2 = "1910-1929 - 70/30"	($5,029)	($917)	($541)	$0	$0	$0	$0	$0
3 = "1920-1939 - 70/30"	$0	$0	$0	$0	$0	$0	$0	$0
4 = "1930-1949 - 70/30"	($7,365)	($5,596)	($5,471)	($4,900)	($4,900)	($4,900)	($4,900)	($4,900)
5 = "1940-1959 - 70/30"	($1,500)	$0	$0	$0	$0	$0	$0	$0
6 = "1950-1969 - 70/30"	$0	$0	$0	$0	$0	$0	$0	$0
7 = "1960-1979 - 70/30"	($6,891)	($2,609)	($399)	$0	$0	$0	$0	$0
8 = "1970-1989 - 70/30"	($5,045)	$0	$0	$0	$0	$0	$0	$0
9 = "1980-1999 - 70/30"	$0	$0	$0	$0	$0	$0	$0	$0
10 = "1990-2009 - 70/30"	$0	$0	$0	$0	$0	$0	$0	$0
11 = "2000-2019 - 70/30"	($7,946)	($6,440)	($5,595)	($5,595)	($4,781)	($4,781)	($3,153)	($3,072)
12 = "Flat 7.00% & 2.25%"	$0	$0	$0	$0	$0	$0	$0	$0
Average (Cases 1-11)		($1,415)	($1,091)	($954)	($880)	($880)	($732)	($725)

2-4x and 3-5x Dynamic Inflation Proofing
With ERA Shifted into Fixed Income

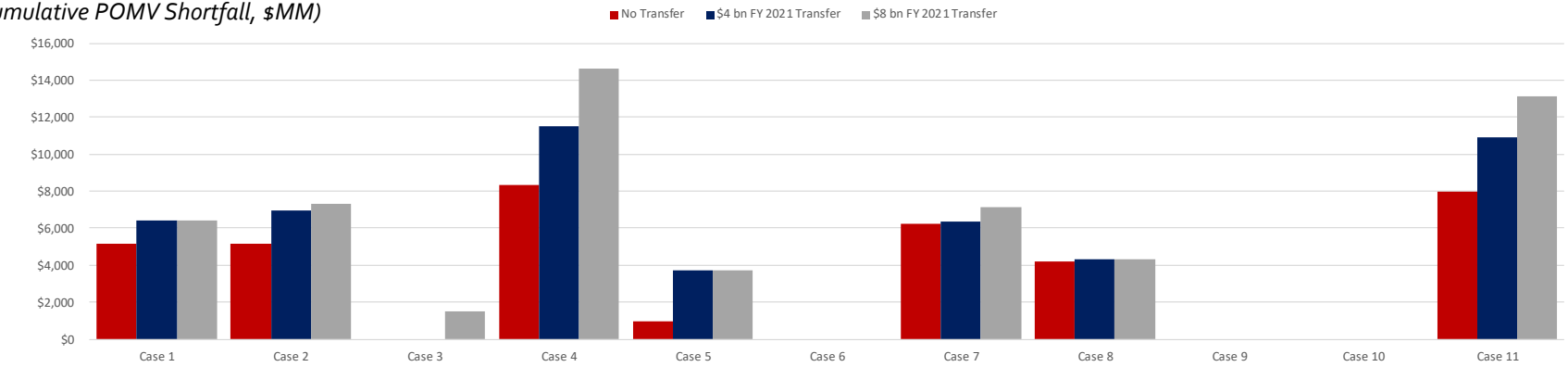
($ in millions)	2 - 4x Rule Dynamic Inflation Proofing					
	Shortfall Year	**Initial Shortfall**	**Cum. Shortfall**	**Worst % Shortfall**	**# Shortfall Years**	**Cum. Infl. SF**
1 = "1900-1919 - 70/30"	N/A	$0	$0	0%	0.00	$44,747
2 = "1910-1929 - 70/30"	FY 2030	$280	$917	14%	3.00	$0
3 = "1920-1939 - 70/30"	N/A	$0	$0	0%	0.00	$0
4 = "1930-1949 - 70/30"	FY 2026	$2,036	$5,596	88%	3.00	$10,998
5 = "1940-1959 - 70/30"	N/A	$0	$0	0%	0.00	$0
6 = "1950-1969 - 70/30"	N/A	$0	$0	0%	0.00	$0
7 = "1960-1979 - 70/30"	FY 2036	$1,269	$2,493	28%	2.00	$47,250
8 = "1970-1989 - 70/30"	N/A	$0	$0	0%	0.00	$0
9 = "1980-1999 - 70/30"	N/A	$0	$0	0%	0.00	$0
10 = "1990-2009 - 70/30"	N/A	$0	$0	0%	0.00	$0
11 = "2000-2019 - 70/30"	FY 2026	$191	$6,440	89%	6.00	$10,736

($ in millions)	3 - 5x Rule Dynamic Inflation Proofing					
	Shortfall Year	**Initial Shortfall**	**Cum. Shortfall**	**Worst % Shortfall**	**# Shortfall Years**	**Cum. Infl. SF**
1 = "1900-1919 - 70/30"	N/A	$0	$0	0%	0.00	$45,936
2 = "1910-1929 - 70/30"	N/A	$0	$0	0%	0.00	$2,518
3 = "1920-1939 - 70/30"	N/A	$0	$0	0%	0.00	$0
4 = "1930-1949 - 70/30"	FY 2026	$2,036	$4,900	88%	3.00	$14,191
5 = "1940-1959 - 70/30"	N/A	$0	$0	0%	0.00	$0
6 = "1950-1969 - 70/30"	N/A	$0	$0	0%	0.00	$0
7 = "1960-1979 - 70/30"	N/A	$0	$0	0%	0.00	$48,459
8 = "1970-1989 - 70/30"	N/A	$0	$0	0%	0.00	$0
9 = "1980-1999 - 70/30"	N/A	$0	$0	0%	0.00	$0
10 = "1990-2009 - 70/30"	N/A	$0	$0	0%	0.00	$0
11 = "2000-2019 - 70/30"	FY 2027	$350	$5,595	90%	5.00	$14,156

Impact of an Initial Ad Hoc Transfer to Principal
No Change to ERA Asset Allocation

- Ad hoc transfers of balances from the Earnings Reserve Account to the Principal have the impact of increasing the likelihood of POMV Shortfall, reducing the time cushion until shortfall, and increasing the severity of experienced POMV Shortfalls
- Analysis below illustrates the base case impact of an additional $4 billion and $8 billion ad hoc transfer from ERA to Principal in FY 2021 (base case with no asset allocation of ERA unchanged)

(Cumulative POMV Shortfall, $MM)



Initial Shortfall Year	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10	Case 11
No Transfer	FY 2036	FY 2026	N/A	FY 2024	FY 2024	N/A	FY 2035	FY 2026	N/A	N/A	FY 2024
$4 bn FY 2021 Transfer	FY 2035	FY 2025	N/A	FY 2023	FY 2023	N/A	FY 2032	FY 2026	N/A	N/A	FY 2024
$8 bn FY 2021 Transfer	FY 2035	FY 2024	FY 2022	FY 2022	FY 2023	N/A	FY 2031	FY 2026	N/A	N/A	FY 2022

Impact of POMV Step-Down/Floor Construct
Base Case, ERA Asset Allocation Unchanged

($ in millions)

	Base Case				3.5% POMV at <3x ERA/POMV (Base Case)			
	Cumulative POMV Shortfall	Initial Shortfall Year	# Shortfall Years	Worst % Shortfall	Cumulative POMV Shortfall	Initial Shortfall Year	# Shortfall Years	Worst % Shortfall
1 = "1900-1919 - 70/30"	($5,189)	FY 2036	2	58%	($1,468)	FY 2039	1	41%
2 = "1910-1929 - 70/30"	($5,140)	FY 2026	4	66%	($1,180)	FY 2029	1	53%
3 = "1920-1939 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%
4 = "1930-1949 - 70/30"	($8,346)	FY 2024	5	96%	($3,651)	FY 2025	4	94%
5 = "1940-1959 - 70/30"	($992)	FY 2024	1	32%	($32)	FY 2024	1	1%
6 = "1950-1969 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%
7 = "1960-1979 - 70/30"	($6,249)	FY 2035	3	100%	($3,213)	FY 2036	1	100%
8 = "1970-1989 - 70/30"	($4,188)	FY 2026	2	100%	($2,567)	FY 2026	1	100%
9 = "1980-1999 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%
10 = "1990-2009 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%
11 = "2000-2019 - 70/30"	($8,005)	FY 2024	8	90%	($1,776)	FY 2025	3	51%

Impact of POMV Step-Down/Floor Construct
ERA Asset Allocation Shifted to Fixed Income & 4x POMV Construct

- If one were to combine (i) the 4x POMV in ERA construct with (ii) ERA Shifted to Fixed Income and (iii) a 3.5% POMV floor at either 2x or 3x POMV in ERA there are no instances of a POMV shortfall in any of the cases over the 20 year horizon
- Elimination of either (i), (ii), or (iii) above does result in instances of POMV Shortfalls

($ in millions)

	3.5% POMV at <2x ERA/POMV (Shift ERA AA, 4x POMV Inf. Proofing)				3.5% POMV at <3x ERA/POMV (Shift ERA AA, 4x POMV Inf. Proofing)			
	Cumulative POMV Shortfall	Initial Shortfall Year	# Shortfall Years	Worst % Shortfall	Cumulative POMV Shortfall	Initial Shortfall Year	# Shortfall Years	Worst % Shortfall
1 = "1900-1919 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%
2 = "1910-1929 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%
3 = "1920-1939 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%
4 = "1930-1949 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%
5 = "1940-1959 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%
6 = "1950-1969 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%
7 = "1960-1979 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%
8 = "1970-1989 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%
9 = "1980-1999 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%
10 = "1990-2009 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%
11 = "2000-2019 - 70/30"	$0	N/A	0	0%	$0	N/A	0	0%

Pros vs. Cons of a Different Allocation for ERA Assets

Pros

+ Increased expected returns for Corpus (the portion of the Fund with the longest time-horizon and highest ability to take risk)
+ Potential in many cases to delay a POMV shortfall by several years giving policy-makers time to react to the prevailing fiscal environment
+ Especially when used in conjunction with an ERA buffer construct (e.g., 4x POMV) tends to reduce the severity of POMV shortfalls when they occur
+ Missed POMV shortfalls in some cases (e.g., Case 8 with 2-3x POMV in ERA construct, pages 10-11)
+ Necessary ingredient in only set of rules identified that eliminates any POMV shortfalls in all eleven scenarios (previous page)

Cons

- Increased risk profile and expected volatility for Corpus (however, overall Fund risk/return profile unchanged)
- Few instances where a POMV shortfall may be avoided by this change alone (tends to only impact severity and timing)
- If not coupled with an ERA buffer construct (e.g., 4x POMV) does not tend to materially reduce the severity of POMV shortfalls
- Finance and accounting complexity and upfront implementation effort

Dividend vs. POMV Draw Analysis

Projected Ratio of Statutory Dividend Transfer to POMV

Red represents >= 100%

Yellow represents >65% and <100%

Green represents <= 65%

65% is approximate ratio for FY 2021

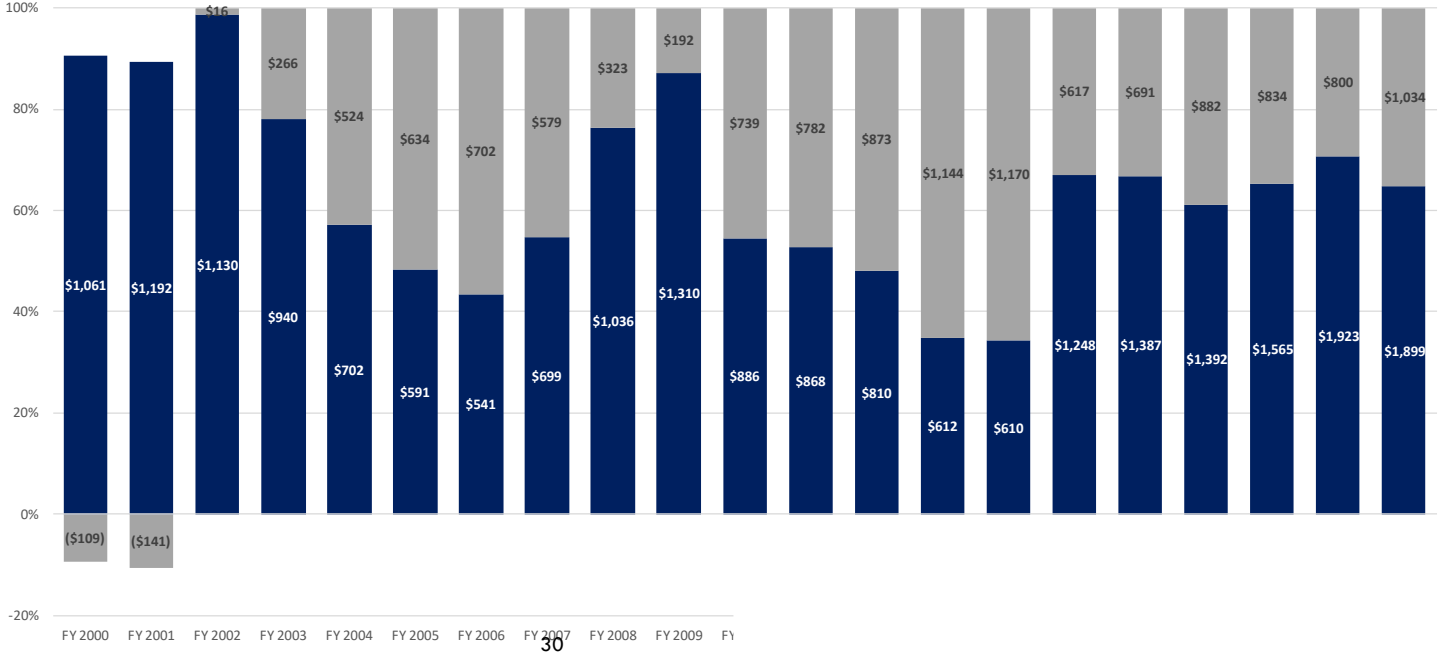
($ in millions)

	Year 1 FY 2021	Year 2 FY 2022	Year 3 FY 2023	Year 4 FY 2024	Year 5 FY 2025	Year 6 FY 2026	Year 7 FY 2027	Year 8 FY 2028	Year 9 FY 2029	Year 10 FY 2030
1 = "1900-1919 - 70/30"	64.86%	73.54%	78.22%	71.99%	68.43%	71.87%	75.33%	73.93%	62.17%	69.91%
2 = "1910-1929 - 70/30"	64.86%	65.44%	61.03%	49.11%	43.87%	35.35%	41.37%	46.12%	39.17%	44.21%
3 = "1920-1939 - 70/30"	64.86%	62.38%	58.37%	51.21%	52.64%	57.38%	75.38%	85.45%	96.69%	113.35%
4 = "1930-1949 - 70/30"	64.86%	60.60%	40.82%	11.41%	0.17%	0.00%	0.00%	32.76%	46.00%	54.13%
5 = "1940-1959 - 70/30"	64.86%	64.88%	54.43%	40.39%	42.51%	44.80%	62.44%	72.92%	76.28%	74.20%
6 = "1950-1969 - 70/30"	64.86%	77.19%	84.31%	83.59%	86.33%	101.21%	110.68%	109.55%	100.92%	108.37%
7 = "1960-1979 - 70/30"	64.86%	68.94%	72.44%	60.63%	64.92%	68.66%	73.93%	66.90%	71.46%	71.03%
8 = "1970-1989 - 70/30"	64.86%	70.53%	72.21%	68.08%	65.10%	52.07%	50.86%	52.44%	45.04%	46.54%
9 = "1980-1999 - 70/30"	64.86%	77.83%	76.29%	75.98%	87.63%	93.50%	102.96%	115.17%	112.60%	111.80%
10 = "1990-2009 - 70/30"	64.86%	67.46%	72.74%	67.32%	73.01%	72.06%	85.74%	91.38%	104.54%	117.18%
11 = "2000-2019 - 70/30"	64.86%	65.93%	57.18%	34.94%	30.00%	24.13%	23.70%	31.64%	45.49%	36.62%
12 = "Flat 7.00% with 2.25% Inflation"	64.86%	70.37%	69.36%	60.36%	62.10%	61.92%	62.73%	63.36%	63.86%	64.24%

Historical Calculated Dividend Amounts vs. Calculated POMV

Historical mix (FY 2000 – FY 2020)

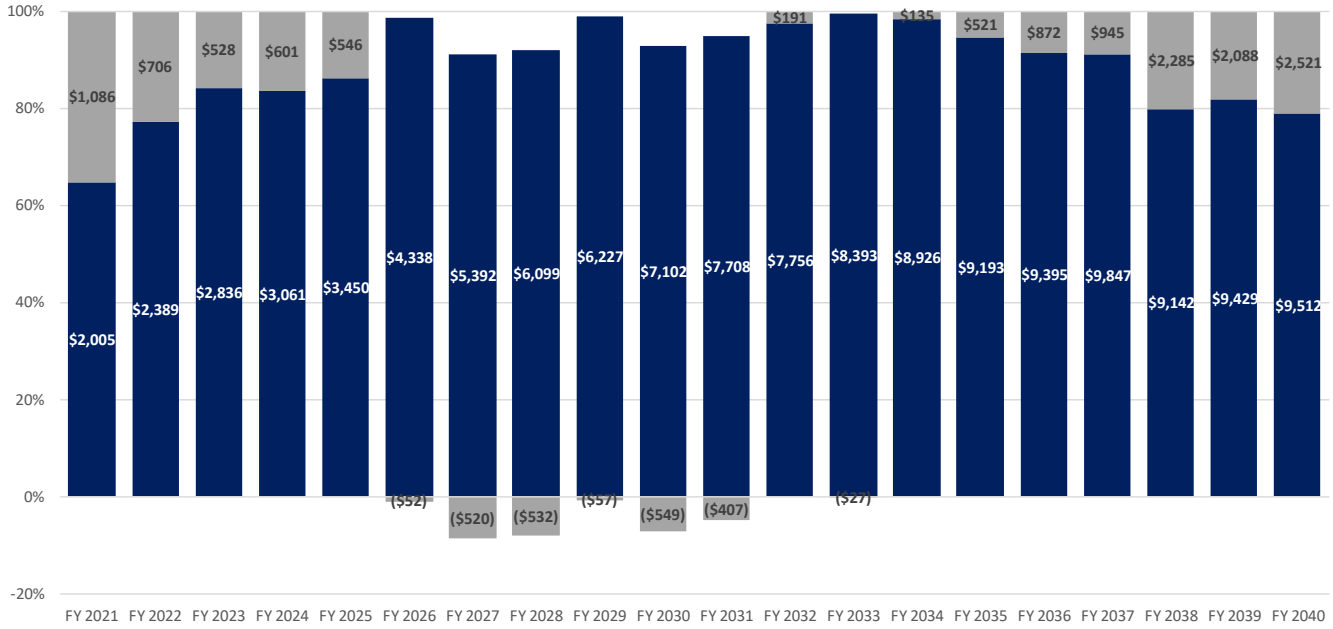
- Dollars (in millions) required for full dividends according to statutory formula
- Implied remaining dollars (in millions) remaining (implied by POMV calculation less dividend formula) for State government spending



Note: analysis looks at actual historical Fund balances and actual historical Statutory Net Income to derive amounts and resultant ratios; analysis is not a simulation of what would've occurred if a POMV were in place throughout the Fund's history. A simulation would potentially result in more volatility as the Fund's value would be reduced each year by the POMV amount.

Projected Mix – Case 6 (1950-1969)

- Dollars (in millions) required for full dividends according to statutory formula
- Implied remaining dollars (in millions) remaining (implied by POMV calculation less dividend formula) for State government spending



Appendix - Case Studies

Case Study: Scenario 4 – "1930-1949 – 70/30"

Narrative / Executive Summary (first ten years of model)

- The "1930 – 1949 – 70/30" scenario is interesting to examine as an extreme downside case; 1929 is remembered as the year of the great market crash, however, as a result of strong stock market performance earlier in the year, only resulted in a 1.46% loss on a diversified portfolio with 1930 really marking the beginning of extremely difficult portfolio performance
- In 1930, the 70/30 portfolio posted a loss of 14.73% followed by losses of 28.25% in 1931, and 4.00% in 1932
- This extremely difficult performance sustained over three years is virtually impossible to weather regardless of strategy (assuming one can not spend Principal and must fund a 5% POMV); highlighting the futility of the discretionary or dynamic inflation proofing strategies in an environment like this is the fact that **there was no inflation in 1930-1932**; de-flation for the three years, in fact, clocked in at 6.40% (1930), 9.32% (1931), and 10.27% (1932)
- The deflation of the early 1930's was followed by modest inflation for the balance of the 1930's (7 year average of 0.97%) resulting in a cumulative maximum inflation proofing **cushion** of $12.1 billion by year three of the model only being worked down to $11.1 billion by year 10 – clearly no policy around inflation has any impact on outcome here
- After the extremely difficult beginning to the 1930's, the 70/30 portfolio actually delivered an average return of 13.91% for the rest of the decade (however, remember that higher percentage returns off lower AUM post declines are required to rebound fully) with a range of annual returns of minus (23.90%) to positive 38.02% (the Great Depression was a volatile time in the markets as the Federal Reserve lacked the power of the printing press (Quantitative Easing) that is so prolifically used today)
- The following page outlines the results of the model (running in the base case for the first ten years of the forecast)

Case Study: Scenario 4 – "1930-1949 – 70/30"

First Ten Years of Forecast (Base Case)

($ in millions)	History Year:		1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
Fiscal Year Ending June 30,	**Model Year:**	**2020PF**	**2021E**	**2022E**	**2023E**	**2024E**	**2025E**	**2026E**	**2027E**	**2028E**	**2029E**	**2030E**
Total Fund Return			(14.73%)	(28.25%)	(4.00%)	38.02%	0.49%	33.32%	25.61%	(23.90%)	22.80%	1.06%
Annual Inflation Rate (CPI)			(6.40%)	(9.32%)	(10.27%)	0.76%	1.52%	2.99%	1.45%	2.86%	(2.78%)	0.00%
Nonspendable Fund Balance - Principal												
Beginning Balance - Contributions			$46,871	$47,215	$45,540	$43,644	$43,970	$44,320	$44,701	$45,774	$47,548	$48,054
Plus: Dedicated State Revenues			344	337	324	326	350	381	425	466	507	530
Plus: Statutory Net Income			0	(2,012)	(2,219)	0	0	0	0	0	0	0
Plus: Inflation Proofing & Special Appropriations			0	0	0	0	0	0	648	1,308	0	0
Ending Balance - Contributions		$46,871	$47,215	$45,540	$43,644	$43,970	$44,320	$44,701	$45,774	$47,548	$48,054	$48,584
Ending Unrealized Gain (Loss)		$6,934	($1,766)	($13,047)	($12,906)	($1,944)	($2,254)	$8,040	$15,161	($568)	$6,920	$4,914
Ending Total Principal Balance		**$53,805**	**$45,449**	**$32,493**	**$30,739**	**$42,026**	**$42,066**	**$52,741**	**$60,935**	**$46,980**	**$54,974**	**$53,498**
Earnings Reserve												
Beginning Balance - Realized			$12,231	$10,101	$6,497	$2,942	$1,073	$428	$3,116	$5,906	$3,876	$4,462
Less: Div/POMV Transfer			(3,091)	(3,095)	(3,119)	(2,072)	(1,025)	(406)	(2,085)	(2,098)	(2,414)	(2,594)
Earnings Reserve Balance Available for Inflation Proofing			$9,139	$7,007	$3,379	$870	$47	$22	$1,030	$3,808	$1,462	$1,868
Less: Inflation Proofing & Special Appropriations			0	0	0	0	(0)	0	(648)	(1,308)	0	0
Plus: Statutory Net Income			962	(509)	(437)	203	381	3,094	5,523	1,376	3,000	2,664
Ending Balance - Realized		$12,231	$10,101	$6,497	$2,942	$1,073	$428	$3,116	$5,906	$3,876	$4,462	$4,532
Ending Unrealized Gain (Loss)		$1,809	($378)	($1,861)	($870)	($47)	($22)	$560	$1,956	($46)	$643	$458
Ending Total Earnings Reserve		**$14,040**	**$9,724**	**$4,636**	**$2,072**	**$1,025**	**$406**	**$3,676**	**$7,862**	**$3,830**	**$5,105**	**$4,990**
Ending Total Fund		**$67,845**	**$55,172**	**$37,128**	**$32,810**	**$43,052**	**$42,472**	**$56,417**	**$68,797**	**$50,810**	**$60,079**	**$58,488**
Cumulative POMV Shortfall			*$0*	*$0*	*$0*	*$820*	*$2,366*	*$4,299*	*$4,299*	*$4,299*	*$4,299*	*$4,299*
Cumulative Inflation Proofing Shortfall		*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*

Case Study: Scenario 4 – "1930-1949 – 70/30"

Narrative / Executive Summary (second ten years of model)

- By the end of the first ten years of the forecast, in spite of POMV shortfalls totaling $4.3 billion between years 4-6 of the model, the Fund is fairly healthy with full POMV made in the last four years and an ending ERA of $5.0 billion
- By FY 2031 in our model (1940 in capital markets history) trouble hits again with back-to-back negative total return years of 5.22% and 8.72%, which the recouped ERA is not in a position to fund; FY 2033 and FY 2034 in our model suffer shortfalls of $2.8 billion and $1.3 billion, respectively
- With the completion of World War II, the balance of the forecast period features impressive returns; averaging 11.2% over eight years
- Inflation, however, rears its head with average CPI increases of 5.6% over the eight years with a peak of 18.13%; the model is not able to fully inflation proof over this period and the base case model ends the twenty year forecast with a $8.5 billion cumulative inflation proofing shortfall and cumulative POMV shortfall of $8.3 billion
- The ERA ends year 20 of the forecast with a balance of $7.4 billion; this relatively large number is a little deceptive; final year Statutory Net Income is $5.5 billion; in the final year the POMV takes Realized ERA available for inflation proofing down to $588 million, which is then topped up by the $5.5 billion, and a $1.3 billion Unrealized Gain in the ERA takes the ERA up to the aforementioned level
- The forecast model thus ends a very difficult two decade period where POMV shortfalls occur in both halves of the forecast and no inflation proofing rules would have prevented a shortfall; fortunately the 1950's were one of the best real return periods on record (avg. total return = 15.6%, avg. inflation = 2.24%)[35]

Case Study: Scenario 4 – "1930-1949 – 70/30"

Second Ten Years of Forecast (Base Case)

($ in millions) History Year:	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
Fiscal Year Ending June 30, Model Year:	**2031E**	**2032E**	**2033E**	**2034E**	**2035E**	**2036E**	**2037E**	**2038E**	**2039E**	**2040E**
Total Fund Return	(5.22%)	(8.72%)	14.79%	18.69%	12.99%	26.56%	(4.68%)	4.22%	4.34%	14.42%
Annual Inflation Rate (CPI)	0.71%	9.93%	9.03%	2.96%	2.30%	2.25%	18.13%	8.84%	2.99%	(2.07%)
Nonspendable Fund Balance - Principal										
Beginning Balance - Contributions	$48,584	$49,461	$49,991	$50,521	$51,051	$51,994	$53,692	$58,700	$61,172	$62,810
Plus: Dedicated State Revenues	530	530	530	530	530	530	530	530	530	530
Plus: Statutory Net Income	0	0	0	0	0	0	0	0	0	0
Plus: Inflation Proofing & Special Appropriations	347	0	0	0	414	1,168	4,478	1,943	1,107	0
Ending Balance - Contributions	$49,461	$49,991	$50,521	$51,051	$51,994	$53,692	$58,700	$61,172	$62,810	$63,339
Ending Unrealized Gain (Loss)	$729	($4,009)	$1,277	$7,400	$10,521	$19,234	$11,787	$10,497	$9,486	$13,942
Ending Total Principal Balance	**$50,190**	**$45,981**	**$51,798**	**$58,450**	**$62,515**	**$72,926**	**$70,487**	**$71,670**	**$72,296**	**$77,281**
Earnings Reserve										
Beginning Balance - Realized	$4,532	$2,894	$120	$1,365	$3,102	$4,204	$7,276	$5,038	$4,507	$4,226
Less: Div/POMV Transfer	(2,765)	(2,925)	(110)	(1,399)	(2,689)	(2,708)	(2,799)	(3,095)	(3,400)	(3,637)
Earnings Reserve Balance Available for Inflation Proofing	$1,767	($30)	$10	($35)	$414	$1,496	$4,478	$1,943	$1,107	$588
Less: Inflation Proofing & Special Appropriations	(347)	0	0	0	(414)	(1,168)	(4,478)	(1,943)	(1,107)	0
Plus: Statutory Net Income	1,474	150	1,355	3,137	4,204	6,949	5,038	4,507	4,226	5,517
Ending Balance - Realized	$2,894	$120	$1,365	$3,102	$4,204	$7,276	$5,038	$4,507	$4,226	$6,105
Ending Unrealized Gain (Loss)	$43	($10)	$35	$450	$851	$2,607	$1,012	$773	$638	$1,344
Ending Total Earnings Reserve	**$2,937**	**$110**	**$1,399**	**$3,552**	**$5,054**	**$9,883**	**$6,050**	**$5,281**	**$4,864**	**$7,449**
Ending Total Fund	**$53,127**	**$46,092**	**$53,197**	**$62,002**	**$67,569**	**$82,809**	**$76,537**	**$76,950**	**$77,160**	**$84,731**
Cumulative POMV Shortfall	*$4,299*	*$4,299*	*$7,080*	*$8,346*	*$8,346*	*$8,346*	*$8,346*	*$8,346*	*$8,346*	*$8,346*
Cumulative Inflation Proofing Shortfall	*$0*	*$0*	*$0*	*$0*	*$607*	*$607*	*$5,865*	*$9,110*	*$9,832*	*$8,529*

Case Study: Scenario 4 – "1930-1949 – 70/30"

Strategies to Navigate

- One perspective to look at this Scenario 4 is that "it is the Great Depression afterall" and the model does make it to year 4 (4 years after the Great Crash of 1929) before the model suffers a modest $820 million POMV shortfall
- By year 5 and year 6 the shortfalls are material at $1.5 billion and $1.9 billion, but they still leave $1 billion and $406 million, respectively for State spending (assuming no dividends)
- Also with the heavy deflation of the early 1930's a dollar in year 4 is worth $1.32 of year 1 money; reducing the inflation-adjusted impact of the shortfalls
- Notably, in this scenario the two tools we have of (i) using a 4x inflation proofing rule (doesn't help in the first ten years but does modestly in the back half) and (ii) shifting the Fund's asset allocation to more Fixed Income in the ERA are both, to a minor degree, beneficial
- Because these tools can't completely close the gap, however, decision-makers in this environment would need to reduce the POMV draws to avoid a shortfall (or "invade" Principal); below are POMV %'s which would allow the model to make it through the 20 year forecast without a POMV shortfall in any year:
  - Base Case: 2.97% POMV draws
  - Base Case with AA Shifted with FI in ERA: 2.74% POMV draws
  - 4x POMV Inflation Proofing Rule: 3.74% POMV draws
  - 4x POMV Inflation Proofing Rule with AA Shifted with FI in ERA: 4.40% POMV draws

Case Study: Scenario 4 – "1930-1949 – 70/30"

Key take-away

- If the Fund entered the Great Depression of the 1930's (i) with the asset allocation shifted to fixed income assets in the ERA and higher returning assets in the Principal (total Fund allocation unchanged) with (ii) utilizing the 4x POMV inflation proofing construct and policy-makers reacted immediately to the Crash of 1929 by lowering the POMV rate from 5.00% to 4.40% the Fund would not incur a POMV in any years of the twenty year horizon
- This modest change to POMV rate might be palatable given the deflationary environment and the overall belt tightening that occurred across America during the Great Depression
- Total scheduled POMV payments at current statutory rates (if they could be made) would have been $55.3 billion over the twenty years (avg of $2.8 billion annually) are reduced to $49.1 billion (avg of $2.5 billion) at a 4.40% POMV rate

Case Study: Scenario 11 – "2000-2019 – 70/30"

Narrative / Executive Summary (first ten years of model)

- The only scenario other than the 1930-1949 / Great Depression scenario where the Fund is not able to weather the twenty year forecast period (assuming the 4x POMV in ERA inflation proofing approach) is the "2000-2019 – 70/30" scenario
- Like the 1930-1940 scenario, this case includes a very difficult market environment with two severe bear markets in the first ten years of the forecast; specifically years 1-3 of the projection (representing 2000-2001) feature Total Fund returns of (2.89%), (5.79%), and (12.39%), respectively; years 4-8 do represent a decent bull market (average return of 10.54%), however, by Year 9, the Great Financial Crisis hits with a (24.33%) annual return
- Exacerbating matters (depleting the ERA in early years further) is the fact that, unlike the 1930's, there were no deflationary years and inflation averaged 2.53% in the first ten years
- The next page illustrates the first ten years of the forecast using the Base Case approach:
  - With the poor portfolio returns of 2000-2002, the ERA is reduced from $14.0 billion to $2.5 billion by the end of year 3 as Statutory Net Income drops in half in year 2 and turns negative by year 3
  - Full inflation proofing occurs in Years 1-3 at a cost of $3.5 billion to the ERA
  - POMV shortfalls occurs in years 4-7, a full POMV is paid in year 8 just in time for the GFC to hit in year 9
- Next comes an illustration of the first ten years of the forecast utilizing the 4x POMV in ERA Inflation Proofing methodology:
  - Methodology prevents any inflation proofing over the ten year horizon (except for year 1) resulting in a modestly smaller cumulative POMV shortfall ($3.3 bn vs. $5.8 bn)
  - Only two small POMV shortfalls occur ($253 mm and $667 mm) until year 10 when there is $2.4 billion (84% POMV shortfall)
- Finally a scenario is shown where the 4x POMV in ERA rule is used in combination with an asset allocation shift to Fixed Income in the ERA
  - This combination is fairly powerful with the forecast making it to year 10 without a POMV shortfall, but with significant POMV shortfalls in years 10 and 11

Case Study: Scenario 11 – "2000-2019 – 70/30"

First Ten Years of Forecast (Base Case)

($ in millions)	History Year:		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Fiscal Year Ending June 30,	**Model Year:**	**2020PF**	**2021E**	**2022E**	**2023E**	**2024E**	**2025E**	**2026E**	**2027E**	**2028E**	**2029E**	**2030E**
Total Fund Return			(2.89%)	(5.79%)	(12.39%)	21.31%	8.92%	4.17%	12.36%	5.94%	(24.33%)	20.30%
Annual Inflation Rate (CPI)			3.39%	1.55%	2.38%	1.88%	3.26%	3.42%	2.54%	4.08%	0.09%	2.72%
Nonspendable Fund Balance - Principal												
Beginning Balance - Contributions			$46,871	$48,802	$49,897	$51,038	$51,364	$51,714	$52,095	$52,520	$53,266	$53,523
Plus: Dedicated State Revenues			344	337	324	326	350	381	425	466	507	530
Plus: Statutory Net Income			0	0	(369)	0	0	0	0	0	(298)	0
Plus: Inflation Proofing & Special Appropriations			1,587	757	1,186	0	0	0	0	281	49	0
Ending Balance - Contributions		$46,871	$48,802	$49,897	$51,038	$51,364	$51,714	$52,095	$52,520	$53,266	$53,523	$54,053
Ending Unrealized Gain (Loss)		$6,934	$3,430	($666)	($6,781)	$1,083	$3,492	$3,519	$6,998	$7,166	($7,340)	$674
Ending Total Principal Balance		**$53,805**	**$52,232**	**$49,231**	**$44,257**	**$52,447**	**$55,206**	**$55,614**	**$59,518**	**$60,432**	**$46,183**	**$54,727**
Earnings Reserve												
Beginning Balance - Realized			$12,231	$10,085	$7,428	$2,859	$1,677	$2,070	$2,041	$2,986	$3,288	$335
Less: Div/POMV Transfer			(3,091)	(3,095)	(3,197)	(2,479)	(1,712)	(2,210)	(2,178)	(2,705)	(2,769)	(289)
Earnings Reserve Balance Available for Inflation Proofing			$9,139	$6,990	$4,231	$380	($35)	($140)	($138)	$281	$519	$46
Less: Inflation Proofing & Special Appropriations			(1,587)	(757)	(1,186)	0	0	0	0	(281)	(49)	(0)
Plus: Statutory Net Income			2,533	1,196	(186)	1,297	2,106	2,180	3,124	3,288	(135)	1,208
Ending Balance - Realized		$12,231	$10,085	$7,428	$2,859	$1,677	$2,070	$2,041	$2,986	$3,288	$335	$1,254
Ending Unrealized Gain (Loss)		$1,809	$709	($99)	($380)	$35	$140	$138	$398	$442	($46)	$16
Ending Total Earnings Reserve		**$14,040**	**$10,794**	**$7,329**	**$2,479**	**$1,712**	**$2,210**	**$2,178**	**$3,384**	**$3,730**	**$289**	**$1,269**
Ending Total Fund		**$67,845**	**$63,026**	**$56,560**	**$46,737**	**$54,159**	**$57,416**	**$57,792**	**$62,902**	**$64,163**	**$46,473**	**$55,997**
Cumulative POMV Shortfall			*$0*	*$0*	*$0*	*$686*	*$1,957*	*$2,609*	*$3,188*	*$3,188*	*$3,188*	*$5,842*
Cumulative Inflation Proofing Shortfall		*$0*	*$0*	*$0*	*$0*	*$959*	*$2,631*	*$4,398*	*$5,721*	*$7,584*	*$7,584*	*$9,041*

Case Study: Scenario 11 – "2000-2019 – 70/30"

First Ten Years of Forecast (4x POMV in ERA Inflation Proofing)

($ in millions)	History Year:		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Fiscal Year Ending June 30,	**Model Year:**	**2020PF**	**2021E**	**2022E**	**2023E**	**2024E**	**2025E**	**2026E**	**2027E**	**2028E**	**2029E**	**2030E**
Total Fund Return			(2.89%)	(5.79%)	(12.39%)	21.31%	8.92%	4.17%	12.36%	5.94%	(24.33%)	20.30%
Annual Inflation Rate (CPI)			3.39%	1.55%	2.38%	1.88%	3.26%	3.42%	2.54%	4.08%	0.09%	2.72%
Nonspendable Fund Balance - Principal												
Beginning Balance - Contributions			$46,871	$48,331	$48,668	$48,632	$48,958	$49,308	$49,689	$50,114	$50,580	$50,809
Plus: Dedicated State Revenues			344	337	324	326	350	381	425	466	507	530
Plus: Statutory Net Income			0	0	(360)	0	0	0	0	0	(278)	0
Plus: Inflation Proofing & Special Appropriations			1,116	0	0	0	0	0	0	0	0	0
Ending Balance - Contributions		$46,871	$48,331	$48,668	$48,632	$48,958	$49,308	$49,689	$50,114	$50,580	$50,809	$51,339
Ending Unrealized Gain (Loss)		$6,934	$3,397	($649)	($6,461)	$998	$3,353	$3,403	$6,713	$6,838	($6,945)	$651
Ending Total Principal Balance		**$53,805**	**$51,728**	**$48,019**	**$42,171**	**$49,956**	**$52,661**	**$53,092**	**$56,827**	**$57,418**	**$43,864**	**$51,989**
Earnings Reserve												
Beginning Balance - Realized			$12,231	$10,556	$8,657	$5,265	$3,375	$2,436	$1,930	$2,857	$3,351	$535
Less: Div/POMV Transfer			(3,091)	(3,095)	(3,197)	(3,165)	(2,983)	(2,602)	(2,062)	(2,650)	(2,685)	(462)
Earnings Reserve Balance Available for Inflation Proofing			$9,139	$7,462	$5,460	$2,100	$392	($166)	($132)	$207	$666	$73
Less: Inflation Proofing & Special Appropriations			(1,116)	0	0	0	0	0	0	0	0	0
Plus: Statutory Net Income			2,533	1,196	(195)	1,275	2,044	2,095	2,989	3,144	(130)	1,150
Ending Balance - Realized		$12,231	$10,556	$8,657	$5,265	$3,375	$2,436	$1,930	$2,857	$3,351	$535	$1,223
Ending Unrealized Gain (Loss)		$1,809	$742	($115)	($700)	$69	$166	$132	$383	$453	($73)	$16
Ending Total Earnings Reserve		**$14,040**	**$11,298**	**$8,542**	**$4,566**	**$3,444**	**$2,602**	**$2,062**	**$3,240**	**$3,804**	**$462**	**$1,239**
Ending Total Fund		**$67,845**	**$63,026**	**$56,560**	**$46,737**	**$53,400**	**$55,263**	**$55,153**	**$60,066**	**$61,221**	**$44,326**	**$53,228**
Cumulative POMV Shortfall			*$0*	*$0*	*$0*	*$0*	*$0*	*$253*	*$920*	*$920*	*$920*	*$3,287*
Cumulative Inflation Proofing Shortfall		*$0*	*$472*	*$1,222*	*$2,378*	*$3,292*	*$4,886*	*$6,571*	*$7,833*	*$9,878*	*$9,924*	*$11,307*

Case Study: Scenario 11 – "2000-2019 – 70/30"

First Ten Years of Forecast (4x POMV in ERA Inflation Proofing, FI in ERA)

($ in millions)	History Year:		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Fiscal Year Ending June 30,	**Model Year:**	**2020PF**	**2021E**	**2022E**	**2023E**	**2024E**	**2025E**	**2026E**	**2027E**	**2028E**	**2029E**	**2030E**
Total Fund Return			(2.89%)	(5.79%)	(12.39%)	21.31%	8.92%	4.17%	12.36%	5.94%	(24.33%)	20.30%
Annual Inflation Rate (CPI)			3.39%	1.55%	2.38%	1.88%	3.26%	3.42%	2.54%	4.08%	0.09%	2.72%
Nonspendable Fund Balance - Principal												
Beginning Balance - Contributions			$46,871	$48,802	$49,139	$48,076	$48,402	$48,752	$49,133	$49,558	$50,024	$49,951
Plus: Dedicated State Revenues			344	337	324	326	350	381	425	466	507	530
Plus: Statutory Net Income			0	0	(1,387)	0	0	0	0	0	(579)	0
Plus: Inflation Proofing & Special Appropriations			1,587	0	0	0	0	0	0	0	0	0
Ending Balance - Contributions		$46,871	$48,802	$49,139	$48,076	$48,402	$48,752	$49,133	$49,558	$50,024	$49,951	$50,481
Ending Unrealized Gain (Loss)		$6,934	$1,600	($3,473)	($10,116)	($1,273)	$1,609	$2,019	$5,852	$6,179	($7,937)	($275)
Ending Total Principal Balance		**$53,805**	**$50,402**	**$45,666**	**$37,961**	**$47,129**	**$50,361**	**$51,152**	**$55,411**	**$56,203**	**$42,014**	**$50,206**
Earnings Reserve												
Beginning Balance - Realized			$14,040	$12,400	$10,463	$8,040	$5,658	$4,318	$3,181	$3,164	$3,460	$782
Less: Div/POMV Transfer			(3,091)	(3,095)	(3,195)	(3,159)	(2,970)	(2,834)	(2,703)	(2,618)	(2,643)	(782)
Earnings Reserve Balance Available for Inflation Proofing			$10,948	$9,305	$7,268	$4,881	$2,689	$1,484	$479	$545	$817	$0
Less: Inflation Proofing & Special Appropriations			(1,587)	0	0	0	0	0	0	0	0	0
Plus: Statutory Net Income			3,039	1,158	772	777	1,629	1,698	2,685	2,914	(35)	889
Ending Balance - Realized		$14,040	$12,400	$10,463	$8,040	$5,658	$4,318	$3,181	$3,164	$3,460	$782	$889
Ending Unrealized Gain (Loss)		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Ending Total Earnings Reserve		**$14,040**	**$12,400**	**$10,463**	**$8,040**	**$5,658**	**$4,318**	**$3,181**	**$3,164**	**$3,460**	**$782**	**$889**
Ending Total Fund		**$67,845**	**$62,802**	**$56,129**	**$46,000**	**$52,787**	**$54,679**	**$54,333**	**$58,574**	**$59,663**	**$42,796**	**$51,095**
Cumulative POMV Shortfall			*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$1,997*
Cumulative Inflation Proofing Shortfall		*$0*	*$0*	*$757*	*$1,925*	*$2,829*	*$4,405*	*$6,070*	*$7,318*	*$9,341*	*$9,386*	*$10,746*

Case Study: Scenario 11 – "2000-2019 – 70/30"

Narrative / Executive Summary (second ten years of model)

- The second ten years of Scenario 11 are characterized by a strong bull market driven by unprecedented global Central Bank stimulus, money printing, and quantitative easing; average returns for the 70/30 portfolio for the second ten years is 11.05% with a 1.76% average inflation rate in the United State (as measured by CPI)

- Nonetheless, the model struggles in the early few years of the second decade to make full POMV payments; the driver of this is the low ERA balances coming out of the GFC:
  - The Base Case model has a material POMV shortfall in Years 1 ($1.6 bn) followed by modest shortfalls of $163 mm and $402 mm in Years 2 and 3
  - The model utilizing the 4x POMV in ERA Inflation Proofing fares slightly better but still has a material POMV Shortfalls in Year 1 ($1.5 bn) and modest shortfalls of $164 mm in year 2 and $389 mm in year 3
  - A scenario that combines (i) the 4x POMV in ERA Inflation Proofing with (ii) an asset allocation shift to move Fixed Income to the ERA (while leaving overall Fund asset allocation unchanged) suffers a Year 1 Shortfall of $1.8 bn and in years 2 and 3 suffers shortfalls of $531 mm and $462 mm

- On the basis of minimizing cumulative POMV Shortfall the 4x POMV in ERA rule coupled with asset allocation shift of Fixed Income to ERA fares the best with a twenty-year cumulative shortfall of $4.8 billion, compared to $8.0 billion in the base case and $5.3 billion in the 4x POMV in ERA case (without any asset allocation changes)

Case Study: Scenario 11 – "2000-2019 – 70/30"

Second Ten Years of Forecast (Base Case)

($ in millions)	History Year:	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Fiscal Year Ending June 30,	**Model Year:**	**2031E**	**2032E**	**2033E**	**2034E**	**2035E**	**2036E**	**2037E**	**2038E**	**2039E**	**2040E**
Total Fund Return		12.51%	3.83%	12.47%	22.06%	11.37%	1.13%	9.17%	16.34%	(3.07%)	24.66%
Annual Inflation Rate (CPI)		1.50%	2.96%	1.74%	1.50%	0.76%	0.73%	2.07%	2.11%	1.91%	2.35%
Nonspendable Fund Balance - Principal											
Beginning Balance - Contributions		$54,053	$54,583	$55,113	$55,643	$56,605	$57,563	$58,513	$60,256	$62,057	$63,772
Plus: Dedicated State Revenues		530	530	530	530	530	530	530	530	530	530
Plus: Statutory Net Income		0	0	0	0	0	0	0	0	0	0
Plus: Inflation Proofing & Special Appropriations		0	0	0	432	428	420	1,214	1,271	1,185	1,499
Ending Balance - Contributions		$54,583	$55,113	$55,643	$56,605	$57,563	$58,513	$60,256	$62,057	$63,772	$65,801
Ending Unrealized Gain (Loss)		$4,768	$4,447	$8,074	$15,593	$16,678	$12,237	$13,340	$18,127	$11,008	$21,118
Ending Total Principal Balance		**$59,351**	**$59,560**	**$63,716**	**$72,197**	**$74,241**	**$70,749**	**$73,596**	**$80,184**	**$74,781**	**$86,920**
Earnings Reserve											
Beginning Balance - Realized		$1,254	$2,473	$2,306	$3,318	$5,783	$9,022	$10,884	$11,974	$14,474	$14,845
Less: Div/POMV Transfer		(1,269)	(2,689)	(2,492)	(2,886)	(2,920)	(3,251)	(3,549)	(3,768)	(4,030)	(4,343)
Earnings Reserve Balance Available for Inflation Proofing		($16)	($216)	($186)	$432	$2,863	$5,771	$7,335	$8,205	$10,444	$10,502
Less: Inflation Proofing & Special Appropriations		0	0	0	(432)	(428)	(420)	(1,214)	(1,271)	(1,185)	(1,499)
Plus: Statutory Net Income		2,488	2,522	3,505	5,783	6,587	5,533	5,852	7,540	5,586	8,737
Ending Balance - Realized		$2,473	$2,306	$3,318	$5,783	$9,022	$10,884	$11,974	$14,474	$14,845	$17,739
Ending Unrealized Gain (Loss)		$216	$186	$481	$1,593	$2,614	$2,276	$2,651	$4,228	$2,562	$5,693
Ending Total Earnings Reserve		**$2,689**	**$2,492**	**$3,800**	**$7,376**	**$11,636**	**$13,161**	**$14,624**	**$18,702**	**$17,407**	**$23,432**
Ending Total Fund		**$62,040**	**$62,052**	**$67,516**	**$79,573**	**$85,877**	**$83,910**	**$88,221**	**$98,886**	**$92,188**	**$110,352**
Cumulative POMV Shortfall		*$7,439*	*$7,602*	*$8,005*	*$8,005*	*$8,005*	*$8,005*	*$8,005*	*$8,005*	*$8,005*	*$8,005*
Cumulative Inflation Proofing Shortfall		*$9,849*	*$11,466*	*$12,426*	*44$12,829*	*$12,829*	*$12,829*	*$12,829*	*$12,829*	*$12,829*	*$12,829*

Case Study: Scenario 11 – "2000-2019 – 70/30"

Second Ten Years of Forecast (4x POMV in ERA Inflation Proofing)

($ in millions) History Year: / **Fiscal Year Ending June 30,** Model Year:	**2010** **2031E**	**2011** **2032E**	**2012** **2033E**	**2013** **2034E**	**2014** **2035E**	**2015** **2036E**	**2016** **2037E**	**2017** **2038E**	**2018** **2039E**	**2019** **2040E**
Total Fund Return	12.51%	3.83%	12.47%	22.06%	11.37%	1.13%	9.17%	16.34%	(3.07%)	24.66%
Annual Inflation Rate (CPI)	1.50%	2.96%	1.74%	1.50%	0.76%	0.73%	2.07%	2.11%	1.91%	2.35%
Nonspendable Fund Balance - Principal										
Beginning Balance - Contributions	$51,339	$51,869	$52,398	$52,928	$53,458	$53,988	$56,446	$57,321	$61,132	$63,045
Plus: Dedicated State Revenues	530	530	530	530	530	530	530	530	530	530
Plus: Statutory Net Income	0	0	0	0	0	0	0	0	0	0
Plus: Inflation Proofing & Special Appropriations	0	0	0	0	0	1,928	346	3,281	1,383	1,594
Ending Balance - Contributions	$51,869	$52,398	$52,928	$53,458	$53,988	$56,446	$57,321	$61,132	$63,045	$65,169
Ending Unrealized Gain (Loss)	$4,539	$4,233	$7,680	$14,720	$15,632	$11,792	$12,675	$17,837	$10,864	$20,892
Ending Total Principal Balance	**$56,408**	**$56,631**	**$60,608**	**$68,178**	**$69,620**	**$68,237**	**$69,996**	**$78,969**	**$73,909**	**$86,062**
Earnings Reserve										
Beginning Balance - Realized	$1,223	$2,350	$2,191	$3,154	$5,907	$9,395	$9,640	$11,487	$11,798	$11,896
Less: Div/POMV Transfer	(1,239)	(2,555)	(2,368)	(2,746)	(2,776)	(3,090)	(3,375)	(3,584)	(3,835)	(4,134)
Earnings Reserve Balance Available for Inflation Proofing	($16)	($206)	($177)	$408	$3,131	$6,305	$6,265	$7,902	$7,963	$7,762
Less: Inflation Proofing & Special Appropriations	0	0	0	0	0	(1,928)	(346)	(3,281)	(1,383)	(1,594)
Plus: Statutory Net Income	2,365	2,397	3,331	5,499	6,265	5,262	5,568	7,176	5,316	8,321
Ending Balance - Realized	$2,350	$2,191	$3,154	$5,907	$9,395	$9,640	$11,487	$11,798	$11,896	$14,488
Ending Unrealized Gain (Loss)	$206	$177	$458	$1,627	$2,720	$2,014	$2,540	$3,442	$2,050	$4,645
Ending Total Earnings Reserve	**$2,555**	**$2,368**	**$3,612**	**$7,533**	**$12,116**	**$11,653**	**$14,026**	**$15,240**	**$13,946**	**$19,133**
Ending Total Fund	**$58,963**	**$58,999**	**$64,220**	**$75,712**	**$81,736**	**$79,891**	**$84,023**	**$94,209**	**$87,855**	**$105,194**
Cumulative POMV Shortfall	*$4,788*	*$4,951*	*$5,340*	*$5,340*	*$5,340*	*$5,340*	*$5,340*	*$5,340*	*$5,340*	*$5,340*
Cumulative Inflation Proofing Shortfall	*$12,075*	*$13,612*	*$14,524*	*$15,319*	*$15,723*	*$14,189*	*$15,014*	*$12,942*	*$12,727*	*$12,615*

Case Study: Scenario 11 – "2000-2019 – 70/30"

Second Ten Years of Forecast (4x POMV in ERA Inflation Proofing, FI in ERA)

($ in millions) History Year:	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Fiscal Year Ending June 30, Model Year:	**2031E**	**2032E**	**2033E**	**2034E**	**2035E**	**2036E**	**2037E**	**2038E**	**2039E**	**2040E**
Total Fund Return	12.51%	3.83%	12.47%	22.06%	11.37%	1.13%	9.17%	16.34%	(3.07%)	24.66%
Annual Inflation Rate (CPI)	1.50%	2.96%	1.74%	1.50%	0.76%	0.73%	2.07%	2.11%	1.91%	2.35%
Nonspendable Fund Balance - Principal										
Beginning Balance - Contributions	$50,481	$51,011	$51,541	$52,071	$52,601	$53,130	$53,660	$54,499	$57,861	$58,615
Plus: Dedicated State Revenues	530	530	530	530	530	530	530	530	530	530
Plus: Statutory Net Income	0	0	0	0	0	0	0	0	0	0
Plus: Inflation Proofing & Special Appropriations	0	0	0	0	0	0	309	2,832	223	3,685
Ending Balance - Contributions	$51,011	$51,541	$52,071	$52,601	$53,130	$53,660	$54,499	$57,861	$58,615	$62,829
Ending Unrealized Gain (Loss)	$3,841	$3,589	$7,413	$15,844	$17,781	$13,493	$14,964	$21,013	$12,953	$24,965
Ending Total Principal Balance	**$54,852**	**$55,130**	**$59,484**	**$68,445**	**$70,911**	**$67,153**	**$69,463**	**$78,874**	**$71,568**	**$87,794**
Earnings Reserve										
Beginning Balance - Realized	$889	$2,112	$2,207	$3,133	$5,731	$9,283	$11,281	$13,167	$14,025	$15,037
Less: Div/POMV Transfer	(889)	(2,112)	(2,207)	(2,657)	(2,687)	(3,001)	(3,292)	(3,506)	(3,759)	(4,062)
Earnings Reserve Balance Available for Inflation Proofing	$0	$0	$0	$475	$3,044	$6,283	$7,989	$9,660	$10,266	$10,975
Less: Inflation Proofing & Special Appropriations	0	0	0	0	0	0	(309)	(2,832)	(223)	(3,685)
Plus: Statutory Net Income	2,112	2,207	3,133	5,256	6,239	4,998	5,487	7,197	4,994	8,958
Ending Balance - Realized	$2,112	$2,207	$3,133	$5,731	$9,283	$11,281	$13,167	$14,025	$15,037	$16,248
Ending Unrealized Gain (Loss)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Ending Total Earnings Reserve	**$2,112**	**$2,207**	**$3,133**	**$5,731**	**$9,283**	**$11,281**	**$13,167**	**$14,025**	**$15,037**	**$16,248**
Ending Total Fund	**$56,965**	**$57,338**	**$62,616**	**$74,176**	**$80,195**	**$78,434**	**$82,630**	**$92,900**	**$86,605**	**$104,043**
Cumulative POMV Shortfall	*$3,788*	*$4,319*	*$4,781*	*$4,781*	*$4,781*	*$4,781*	*$4,781*	*$4,781*	*$4,781*	*$4,781*
Cumulative Inflation Proofing Shortfall	*$11,501*	*$13,012*	*$13,909*	*$14,691*	*$15,089*	*$15,477*	*$16,281*	*$14,598*	*$15,480*	*$13,173*

Case Study: Scenario 11 – "2000-2019 – 70/30"

Strategies to Navigate

- In both Case 4 and Case 11 there is no strategy around inflation proofing that can avoid a POMV shortfall at any point (literally zero inflation proofing at any point would still result in POMV Shortfalls)
- Accordingly we are left with the tools of (i) reducing the cumulative POMV shortfalls with the 4x POMV in ERA rule, (ii) shifting Fixed Income assets to the ERA, and (iii) exploring the potential for policy makers to reduce POMV rates at some point when the acuteness of the bear markets become apparent
- As we did in Case 4, below we explore what POMV rate would work (result in no POMV shortfalls); in Case 4 its more plausible that policy-makers would take some sort of immediate action (given the 1929 stock market crash and near immediate onset of the Great Depression), but certainly in either case the figures below show the best case (i.e., immediate change in year 1) and later recognition of the issues would require more drastic reductions to POMV rates (or "invasion" of Principal):
  - Base Case: 2.65% POMV draws
  - Base Case with AA Shifted with FI in ERA: 2.82% POMV draws
  - 4x POMV Inflation Proofing Rule: 4.19% POMV draws
  - 4x POMV Inflation Proofing Rule with AA Shifted with FI in ERA: 4.31% POMV draws