



January, 2022

**Permanent Fund Performance  
Review, and Simulation Model  
Results**

House and Senate Finance  
Committee Presentation

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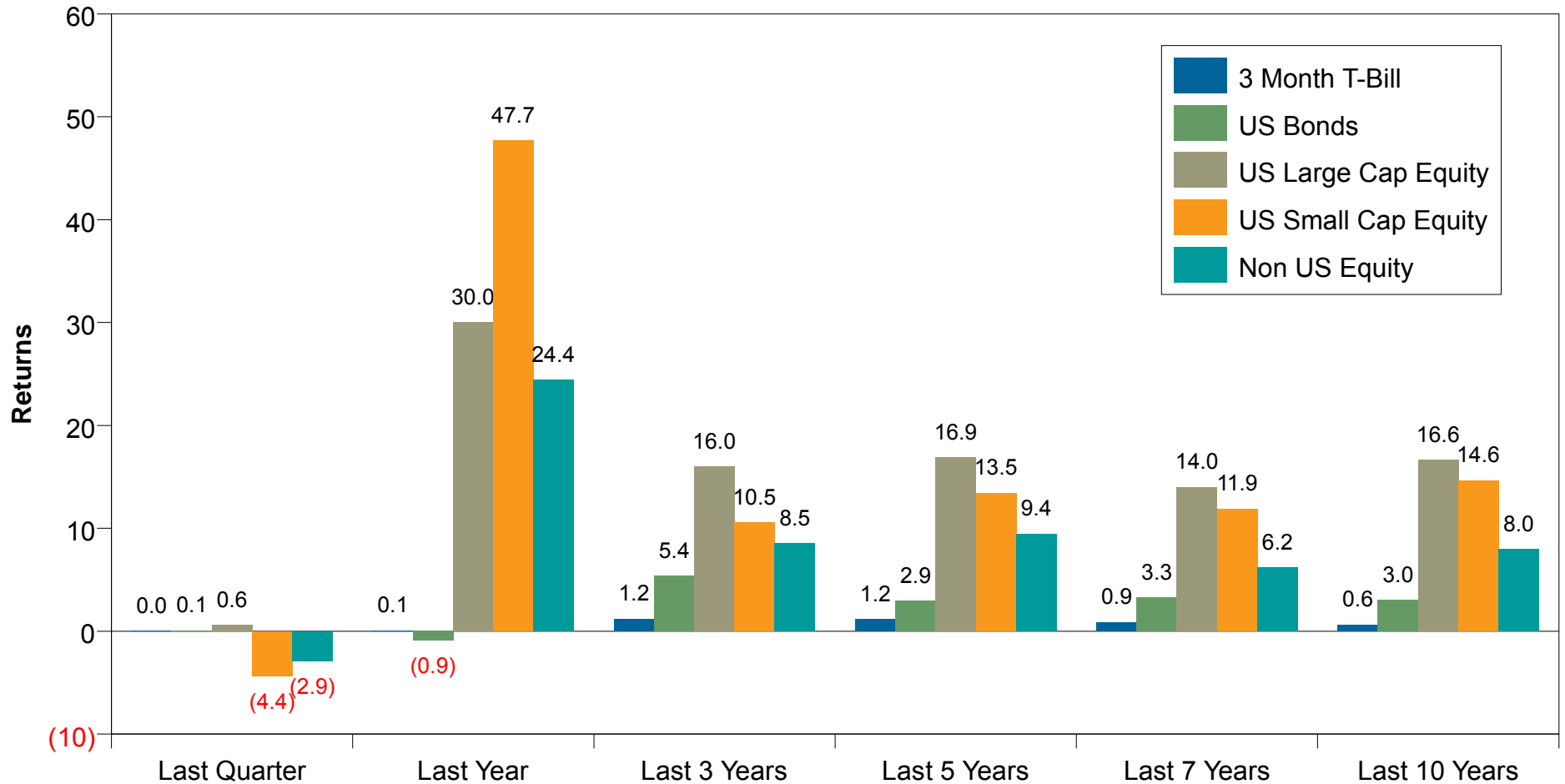
## Performance Overview

Quarter ended September 30,  
2021

# Broad Capital Market Performance

For Periods Ended September 30, 2021

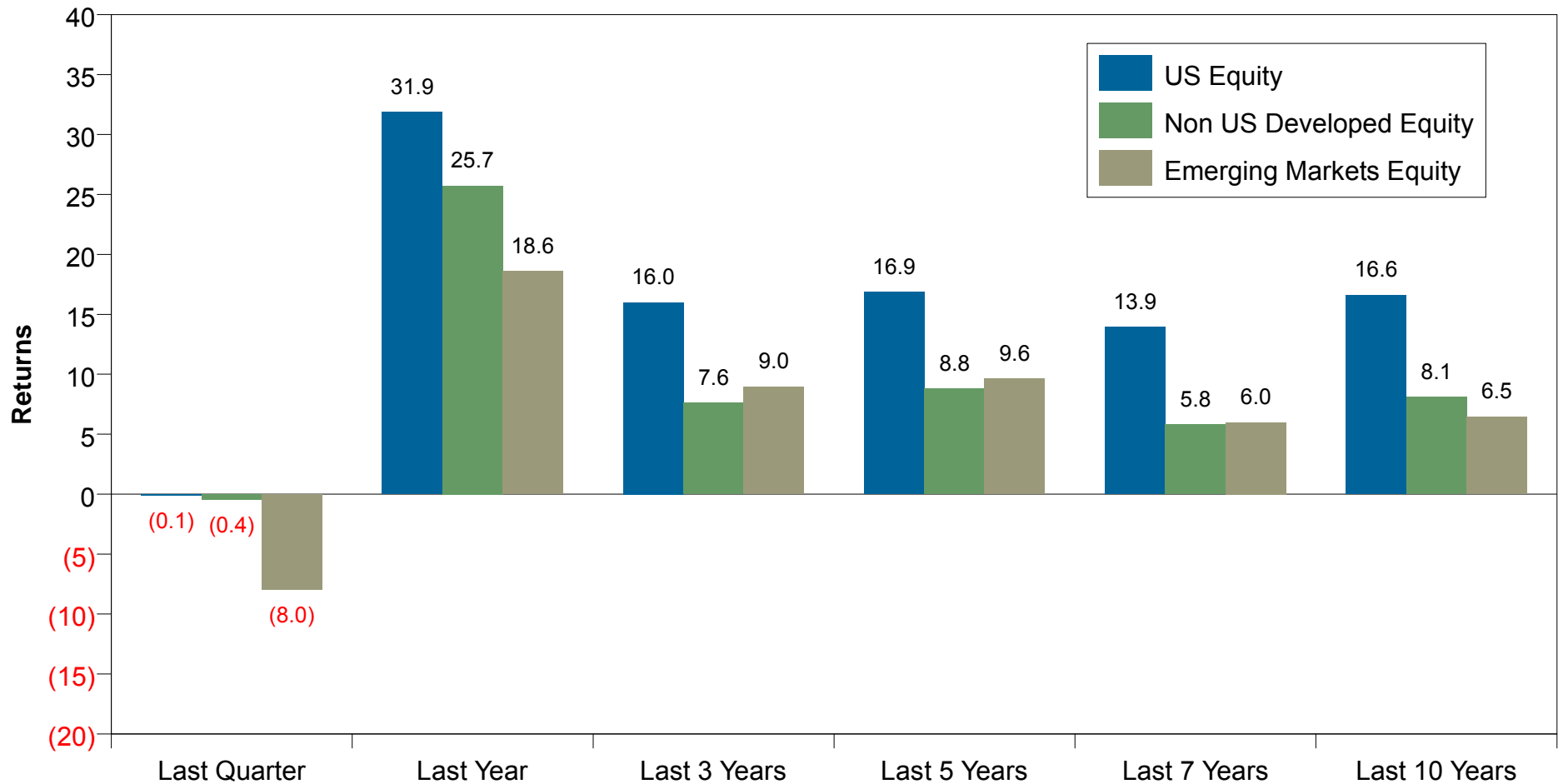
## Returns for periods ended September 30, 2021



# Global Equity Market Performance

For Periods Ended September 30, 2021

## Returns for periods ending September 30, 2021



# Market Environment

## A Pause in Global Equity Markets in 3Q21

- One-year returns from September 2020 are still eye-popping:
  - US Equity: +32%
  - Non US Equity: +27%
  - Private Equity: +56%
  - Real Estate: +12%
- Economic data began to show signs of softening; consumer and business spending hit by the concern over the 3Q surge in the Delta variant of COVID-19.
- 3Q GDP growth dropped sharply to 2% from a robust 6.7% in 2Q, but the economic recovery is still solid.

### Returns for Periods ended 9/30/21

	1 Quarter	1 Year	5 Years	10 Years	25 Years
<b>U.S. Equity</b>					
Russell 3000	-0.10	31.88	16.85	16.60	9.74
S&P 500	0.58	30.00	16.90	16.63	9.65
Russell 2000	-4.36	47.68	13.45	14.63	9.12
<b>Global ex-U.S. Equity</b>					
MSCI World ex USA	-0.66	26.50	8.88	7.88	5.34
MSCI Emerging Markets	-8.09	18.20	9.23	6.09	--
MSCI ACWI ex USA Small Cap	0.00	33.06	10.28	9.44	6.77
<b>Fixed Income</b>					
Bloomberg Barclays Aggregate	0.05	-0.90	2.94	3.01	5.06
90-day T-Bill	0.01	0.07	1.16	0.63	2.11
Bloomberg Barclays Long Gov/Credit	0.07	-2.97	5.21	5.76	7.41
Bloomberg Barclays Global Agg ex-US	-1.59	-1.15	1.10	0.90	3.58
<b>Real Estate</b>					
NCREIF Property	5.23	12.15	6.84	8.99	9.23
FTSE Nareit Equity	0.98	37.39	6.83	11.27	9.99
<b>Alternatives</b>					
CS Hedge Fund	1.19	14.07	5.51	4.88	7.07
Cambridge Private Equity	11.52	56.87	20.98	15.81	15.61
Bloomberg Commodity	6.59	42.29	4.54	-2.66	1.41
Gold Spot Price	-0.82	-7.31	5.93	0.80	6.31
<b>Inflation - CPI-U</b>	0.96	5.39	2.59	1.92	2.23

# Callan Periodic Table of Investment Returns

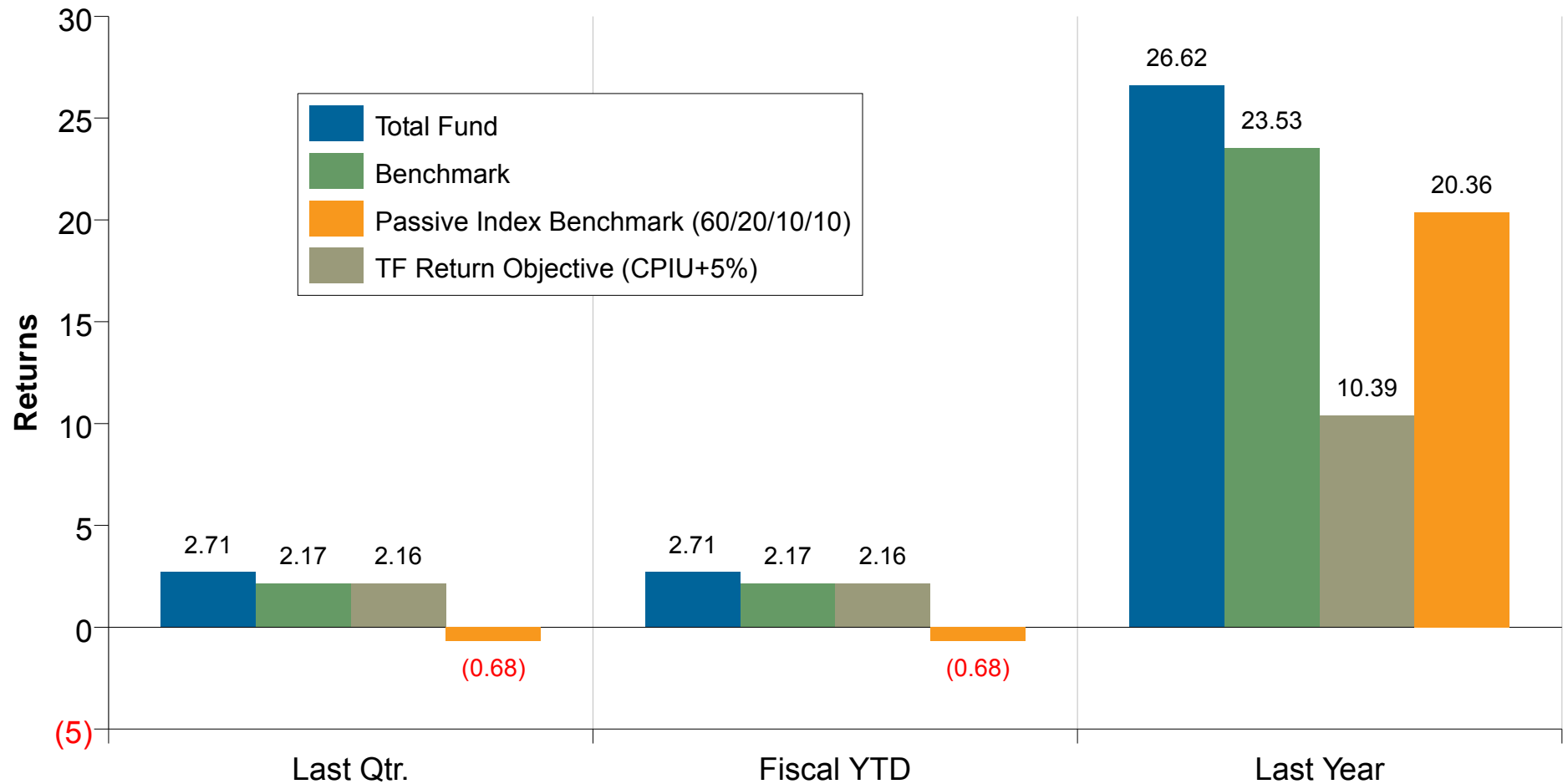
## Calendar Year Returns for Asset Class Indices and Total Fund

2012	2013	2014	2015	2016	2017	2018	2019	2020	3 Qtrs. 2021
Emerging Markets Equity 18.23%	US Small Cap Equity 38.82%	US Large Cap Equity 13.69%	Private Real Estate 3.79%	US Small Cap Equity 21.31%	Emerging Markets Equity 37.28%	Private Real Estate 3.29%	US Large Cap Equity 31.49%	US Small Cap Equity 19.96%	US Large Cap Equity 15.92%
Developed Non US Equity 17.32%	US Large Cap Equity 32.39%	US Fixed Income 5.97%	APFC Total Fund 3.43%	US Large Cap Equity 11.96%	Developed Non US Equity 25.03%	US Fixed Income 0.01%	US Small Cap Equity 25.52%	US Large Cap Equity 18.40%	APFC Total Fund 15.26%
US Small Cap Equity 16.35%	Developed Non US Equity 22.78%	APFC Total Fund 5.28%	US Large Cap Equity 1.38%	Emerging Markets Equity 11.19%	US Large Cap Equity 21.83%	APFC Total Fund -1.10%	Developed Non US Equity 22.01%	Emerging Markets Equity 18.31%	US Small Cap Equity 12.41%
US Large Cap Equity 16.00%	APFC Total Fund 12.76%	US Small Cap Equity 4.89%	US Fixed Income 0.55%	APFC Total Fund 8.41%	APFC Total Fund 16.24%	US Large Cap Equity -4.38%	Emerging Markets Equity 18.44%	APFC Total Fund 12.36%	Developed Non US Equity 8.35%
APFC Total Fund 12.41%	Private Real Estate 4.27%	Private Real Estate 4.07%	Developed Non US Equity -0.81%	Private Real Estate 3.55%	US Small Cap Equity 14.65%	US Small Cap Equity -11.01%	APFC Total Fund 15.70%	Developed Non US Equity 7.82%	Private Real Estate 2.32%
Private Real Estate 4.37%	US Fixed Income -2.02%	Emerging Markets Equity -2.19%	US Small Cap Equity -4.41%	US Fixed Income 2.65%	US Fixed Income 3.54%	Developed Non US Equity -13.79%	US Fixed Income 8.72%	US Fixed Income 7.51%	Emerging Markets Equity -1.25%
US Fixed Income 4.21%	Emerging Markets Equity -2.60%	Developed Non US Equity -4.90%	Emerging Markets Equity -14.92%	Developed Non US Equity 1.00%	Private Real Estate 3.42%	Emerging Markets Equity -14.57%	Private Real Estate 3.27%	Private Real Estate 2.99%	US Fixed Income -1.55%

# APFC Total Fund Cumulative Returns

## Total Fund versus Total Fund Targets

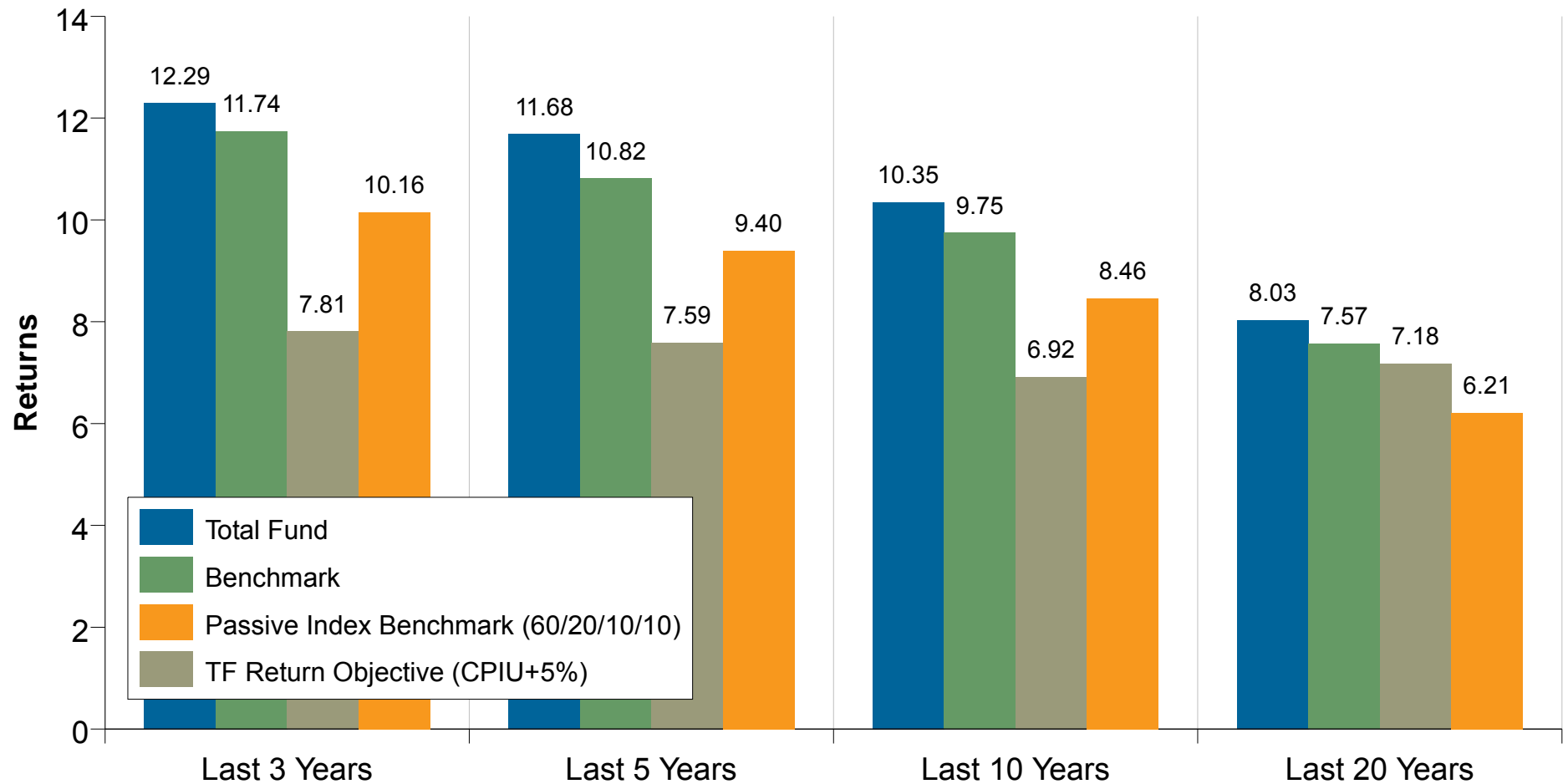
### Returns for Periods Ending September 30, 2021



# APFC Total Fund Cumulative Returns

## Total Fund versus Total Fund Targets

### Returns for Periods Ending September 30, 2021





# APFC Total Fund versus Callan Large Public Fund Database

## Annualized Return Rankings

Returns for Periods Ended September 30, 2021

Group: Callan Public Fund Sponsor - Large (>1B)



10th Percentile

1.62

25.82

12.09

12.03

11.21

8.44

25th Percentile

0.64

23.94

11.43

11.23

10.65

8.20

Median

0.18

22.06

10.50

10.47

10.07

7.92

75th Percentile

(0.14)

20.00

9.70

9.72

9.07

7.31

90th Percentile

(0.50)

18.10

8.92

8.85

8.04

6.83

Total Fund ● A

2.75

26.91

12.40

11.75

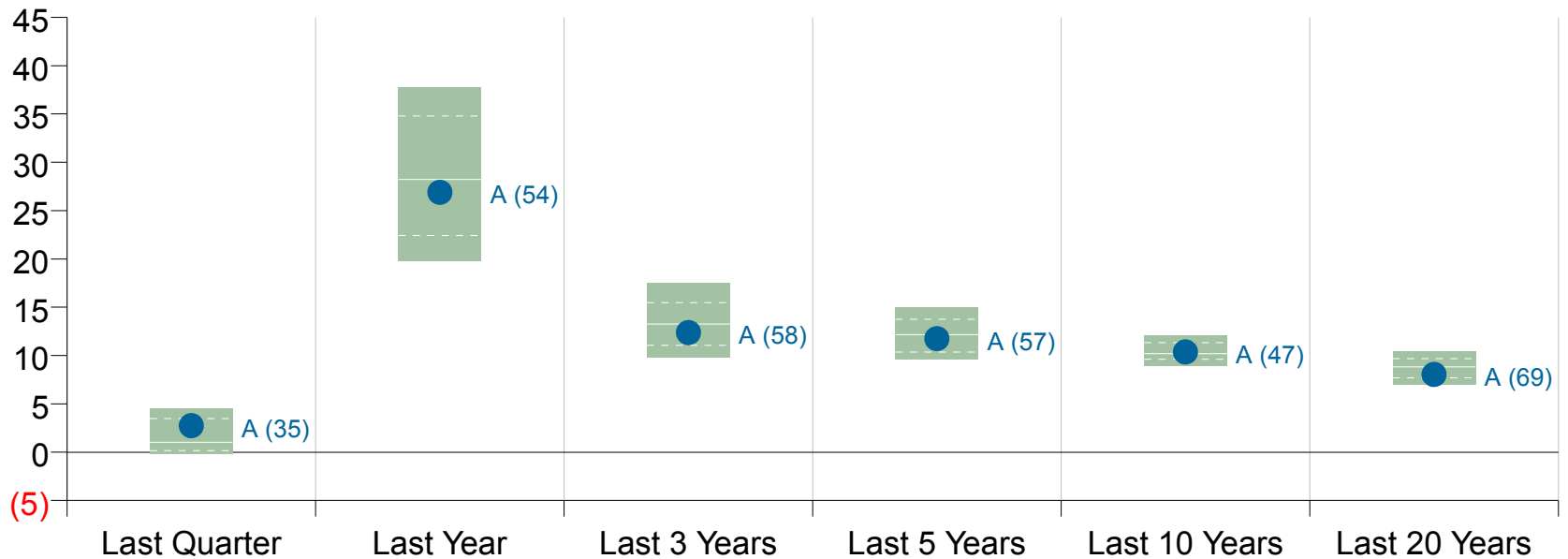
10.38

8.05

# APFC Total Fund versus Callan Large Endowment Database

## Annualized Return Rankings

Returns for Periods Ended September 30, 2021  
 Group: Callan Endow/Foundation - Large (>1B)

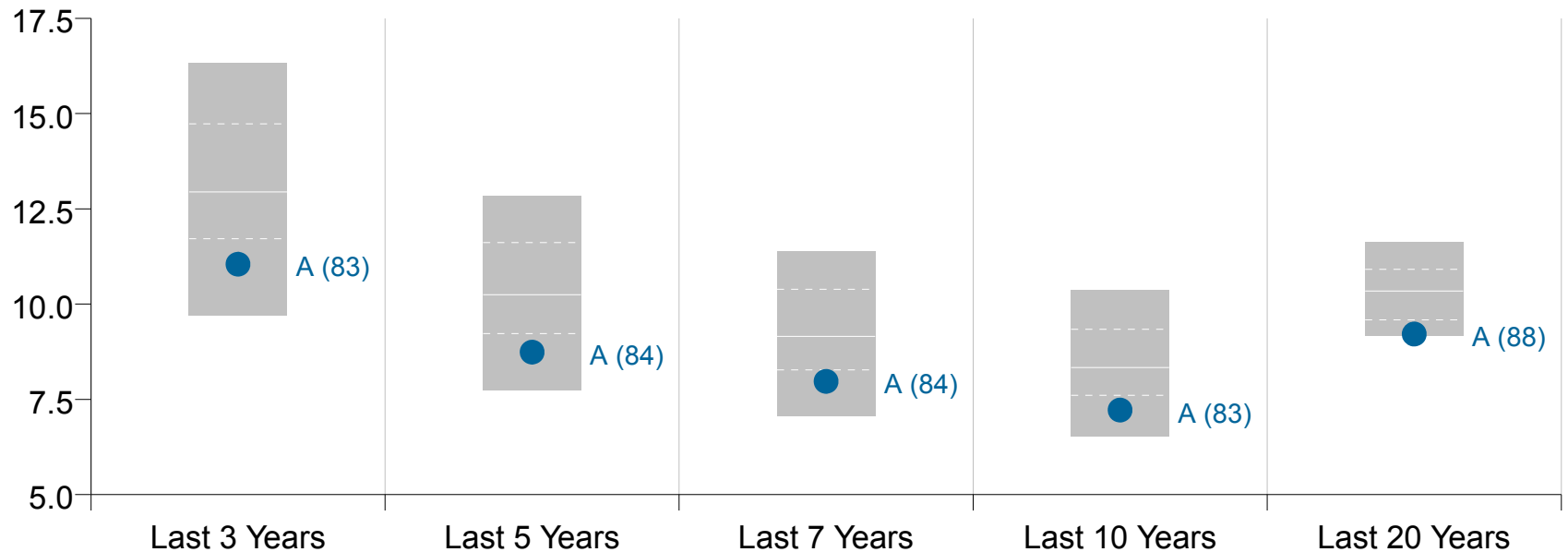


# APFC Total Fund versus Callan Large Public Fund Database

## Annualized Risk Rankings (Standard Deviation)

Standard Deviation for Periods Ended September 30, 2021

Group: Callan Public Fund Sponsor - Large (>1B)



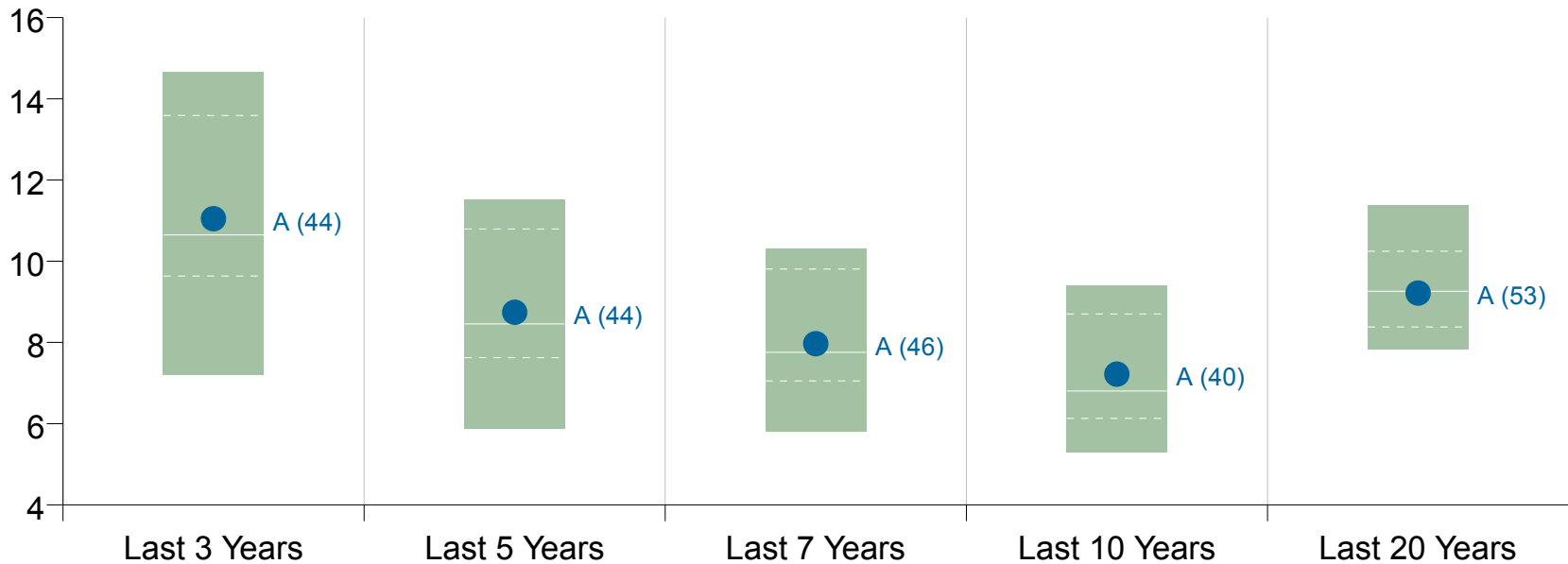
	Last 3 Years	Last 5 Years	Last 7 Years	Last 10 Years	Last 20 Years
10th Percentile	16.34	12.84	11.40	10.36	11.64
25th Percentile	14.73	11.62	10.40	9.34	10.92
Median	12.95	10.25	9.16	8.34	10.35
75th Percentile	11.72	9.23	8.28	7.61	9.59
90th Percentile	9.72	7.74	7.07	6.51	9.17
Total Fund ● A	11.05	8.74	7.97	7.22	9.22

# APFC Total Fund versus Callan Large Endowment Database

## Annualized Risk Rankings (Standard Deviation)

Standard Deviation for Periods Ended September 30, 2021

Group: Callan Endow/Foundation - Large (>1B)



	Last 3 Years	Last 5 Years	Last 7 Years	Last 10 Years	Last 20 Years
10th Percentile	14.65	11.53	10.32	9.40	11.39
25th Percentile	13.59	10.79	9.81	8.70	10.25
Median	10.65	8.46	7.76	6.81	9.26
75th Percentile	9.64	7.63	7.06	6.13	8.38
90th Percentile	7.21	5.89	5.81	5.31	7.84
Total Fund ● A	11.05	8.74	7.97	7.22	9.22



**Simulation Model Results**

Ad Hoc Draw Analysis

# Simulation Model Results

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## Outline

- **Review Accounting Concepts and History**
  - Statutory Net Income
  - Earnings Reserve Account and Principal
- **Review Spending Rule and Appropriation History**
- **Projected Key Financial Variables under Different Appropriation Scenarios**
  - Status Quo – No additional draws
  - One-time ad hoc draw of \$5 billion in FY 2022
  - One-time ad hoc draw of \$1 billion in FY 2022
  - Ad hoc draws of \$1 billion in FY 2022 and 2023
  - Ad hoc draws of \$1 billion in FY 2022, 2023, and 2024
- **Introduce Volatility into Projections using Monte Carlo Simulation**
  - Range of outcomes for key financial variables
    - *Market Value*
    - *Earnings Reserve Balance*
    - *Statutory Net Income*
    - *Probability of an impaired POMV draw*
    - *Principal Balance*

# Statutory Net Income (Realized Return)

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Fiscal Year 2021

- Statutory Net Income (SNI) in each year is the the sum of total income (dividends, coupon payments, real estate income, etc.), plus realized capital gains minus realized capital losses.
- Gains are realized when assets are sold for an amount above their purchase price (cost basis).
- Gains realization events include, annual turnover in equity and bond accounts, rebalancing related turnover, sales to fund distributions, distributions from private market investments, etc.

$$\begin{array}{r} \text{Total Income } \$1.5\text{B} + \\ \text{Total Realized Gains } \$6.4\text{B} = \\ \hline \text{Statutory Net Income } \$7.9\text{B} \end{array}$$

**\*Model assumes if SNI is negative, ERA and Principal share SNI pro-rata. If SNI is positive all SNI goes to ERA.**

# Earnings Reserve Account

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Fiscal Year 2019

- Earnings Reserve Account is equal to total cumulative Statutory Net Income minus total cumulative spending minus total cumulative appropriations to Principal plus a pro-rata share of unrealized gains or losses.
- ERA receives a pro-rata share of unrealized gains or losses based on the size of the ERA relative to the size of Principal.
- ERA receives 100% of SNI if SNI is positive.
- ERA receives pro-rata share of SNI if SNI is negative.

**Beginning Realized ERA \$11.5B +  
Statutory Net Income \$7.9B –  
Appropriations to Principal –  
Distribution \$3.1B =**

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**Ending Realized ERA \$16.3B +  
Pro Rata Unrealized Gains \$4.8B =**

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**Ending ERA Balance \$21.2B**

**Model assumes Unrealized  
Losses are also allocated pro-rata  
between ERA and Principal.**

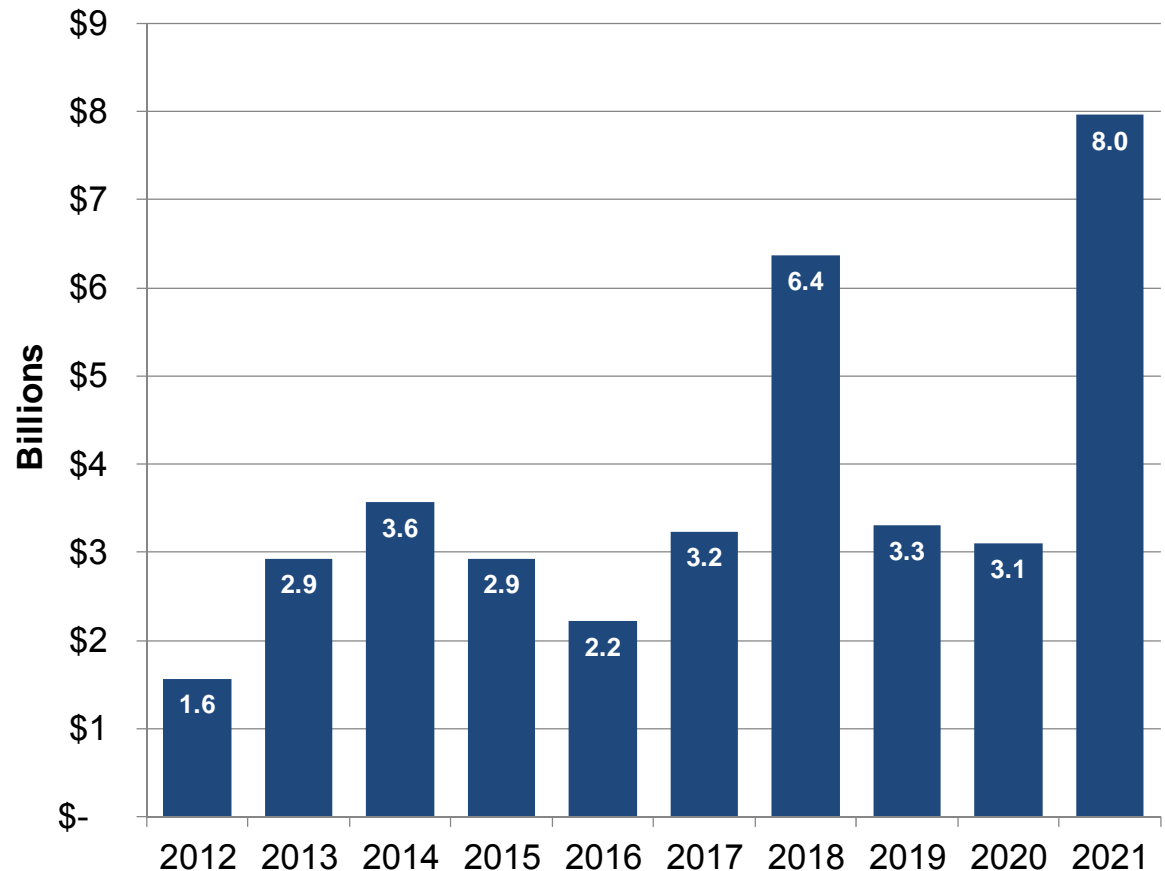


# Historical Statutory Net Income

## Last Ten Years

- Statutory Net Income has been positive in all of the last ten years.
- “Normal” years have been in the \$3 - \$4 billion range.
- 2018 and 2021 experienced outsized Statutory Net Income due to:
  - Strong equity markets;
  - High unrealized gains balances;
  - Increased rebalancing activity resulting in equity sales;
  - Private markets transactions.

## Historical Statutory Net Income

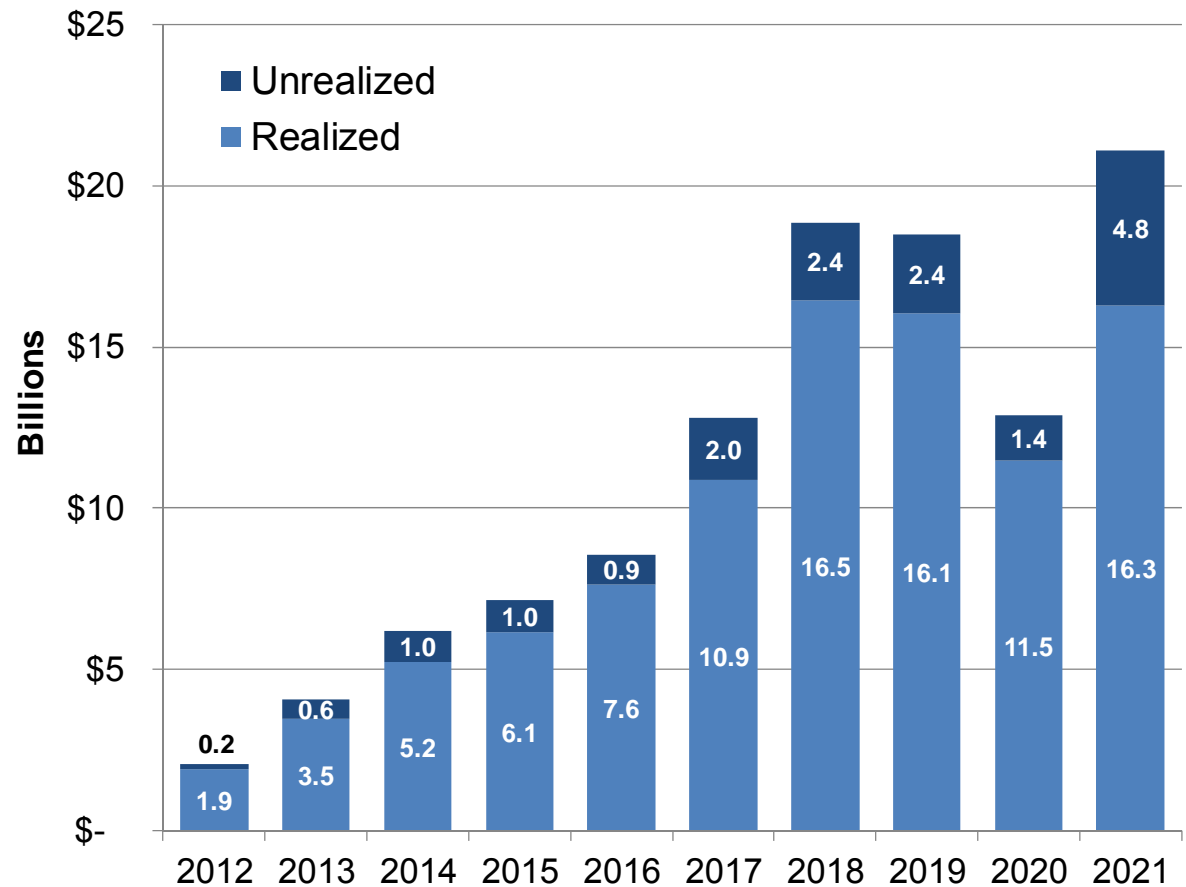


# Historical Earnings Reserve Account Balance

## Last Ten Years

- With healthy Statutory Net income levels Earnings Reserve balance has grown consistently since 2012.
- As ERA balance grows proportion of unrealized gains allocated to ERA increases.
- In 2020 \$4 billion of ERA was appropriated to Principal. This had the knock-on effect of reducing the percent of unrealized gains allocated to ERA.
- Unrealized ERA as percent of total at an historic high at the end of 2021.

## Historical Earnings Reserve Account

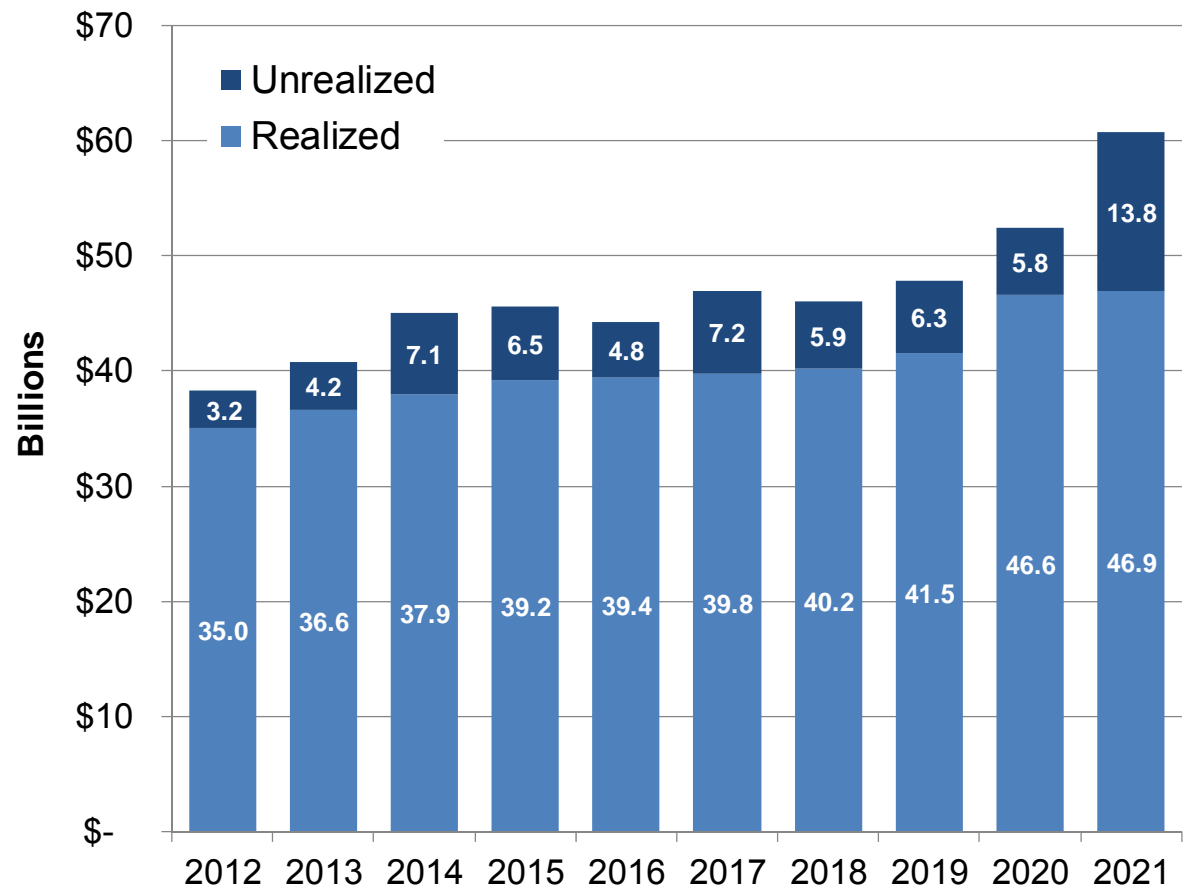


# Historical Principal Account Balance

## Last Ten Years

- The Principal Account balance has grown steadily over time as a result of oil revenue and inflation proofing appropriations.
- \$4 billion appropriation to Principal in 2020. Another one scheduled in 2022.
- The unrealized portion as a percentage of total is at its highest point in the last ten years.
- The unrealized portion of Principal causes some asymmetrical volatility in the Principal balance over time, as Principal absorbs entire unrealized loss balance.

## Historical Principal Balance

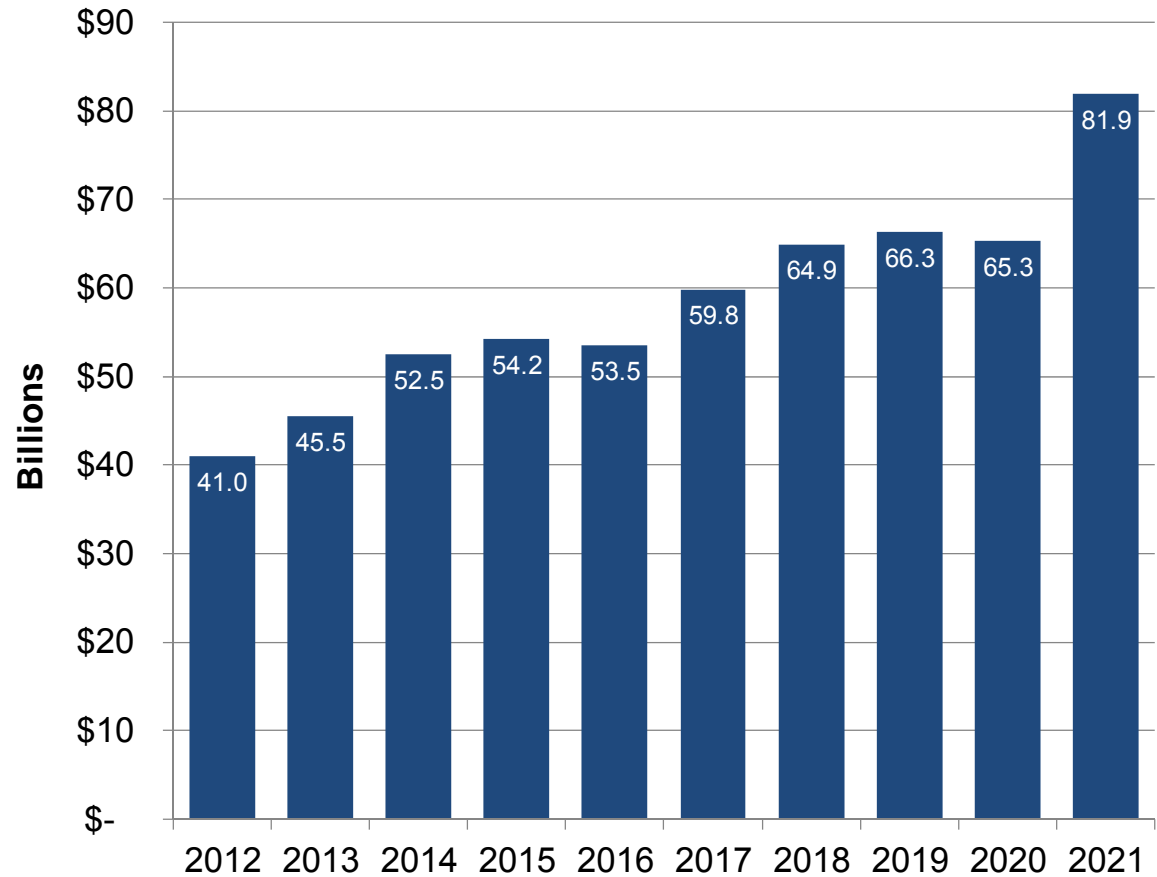


# Historical Ending Market Value

## Last Ten Years

- Market value has grown steadily over last ten years.
- Slight drop in FY 2020 as markets hadn't fully recovered in June.
- Extraordinary increase in FY 2021 with market recovery.
- APFC Public and Private Equity portfolios contributed significantly to this growth in 2021.

## Historical Ending Market Value



# Stochastic versus Simulation Modelling

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## Monte Carlo Simulation

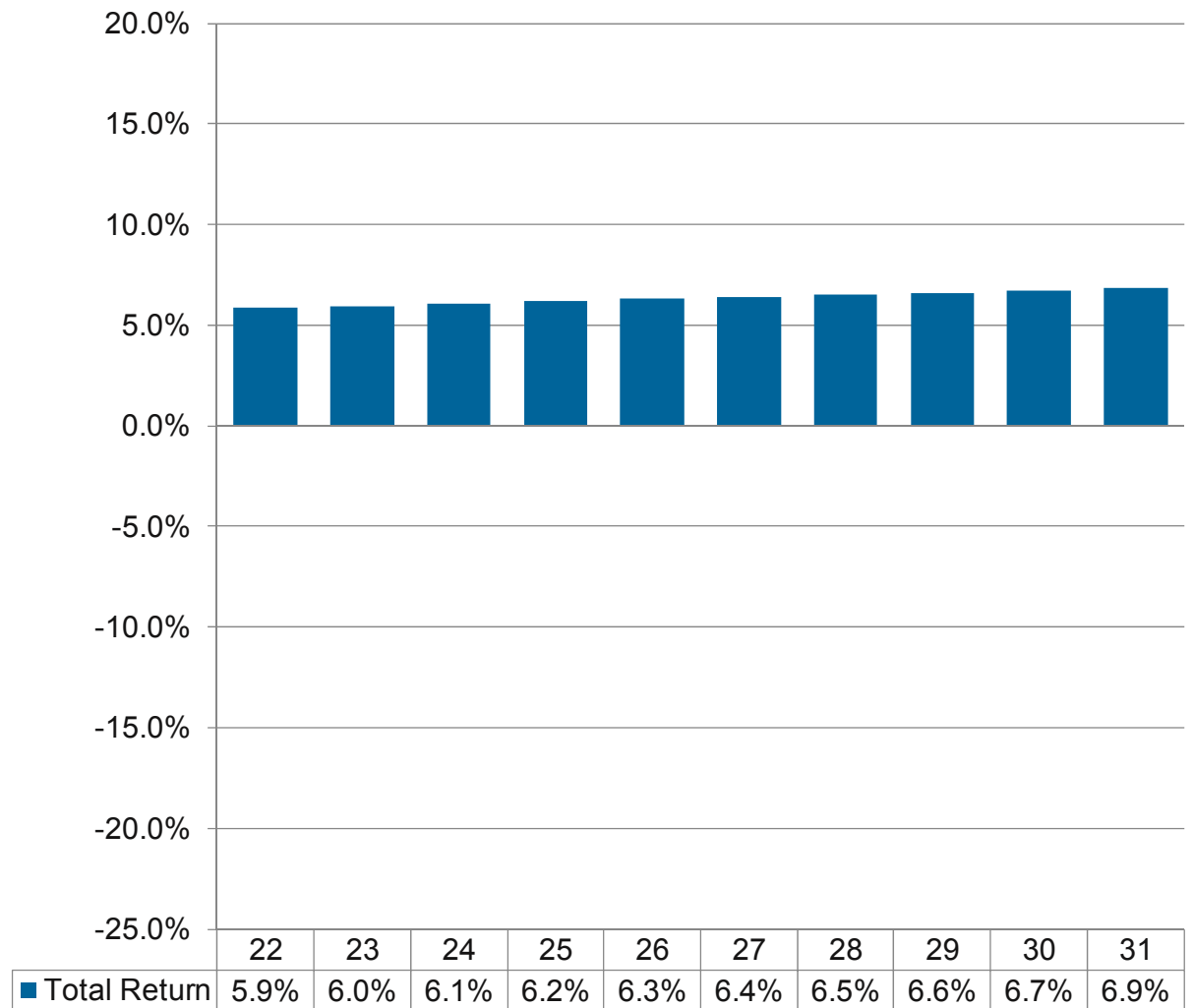
- Stochastic modelling assumes median market outcomes in each year.
- Results are generally intuitive and the models are easier to build.
- No need to consider “corner cases” or things that happen at the limits.
- Lend themselves to graphical representations of variables over time.
- Simulation modelling assumes a range of potential market outcomes in each year.
- Captures the impact of volatility.
- Requires you to consider things that happen at the limits (negative SNI, zero ERA, net unrealized losses (cost basis below market value), etc.).
- Results are less intuitive and more difficult to represent graphically over time.
- Assigns probabilities to various ranges of outcomes for variables of interest (versus point estimates).
- Requires multi-dimensional assumptions for market variables (return, standard deviation, correlation, auto-correlation, etc.).

# Projected Returns (No Volatility)

## Annual Returns Stochastic Projection

- Stochastic projections assume median outcome in each year for market variables (returns, inflation, rates, etc.).
- This results in unrealistically smooth paths for financial variables (EMV, ERA, Principal, etc.).
- Does not reflect the impact of year-to-year market volatility on financial variables of interest.
- Monte Carlo simulation introduces volatility.

Median Annual Returns

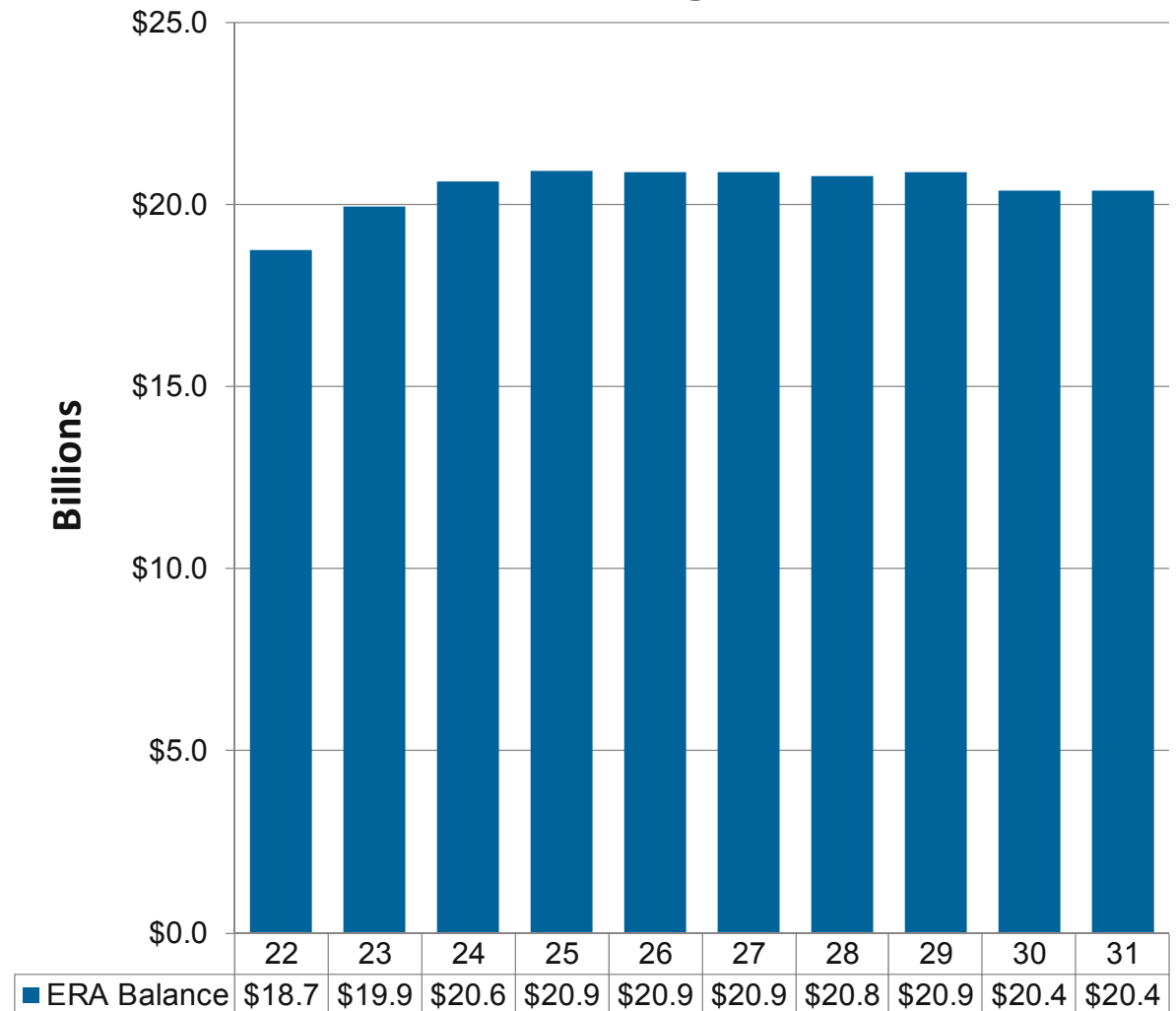


# Projected ERA Balance (No Volatility)

## Earnings Reserve Balance Stochastic Projection

- ERA Balance expected to grow in early years due to Statutory Net Income being amplified by current high unrealized gains balances.
- ERA balance stabilizes in 2024 once unrealized gains normalize.
- After 2024 median projected draw and Statutory Net Income are similar in size resulting in relatively flat ERA.

**Median Earnings Reserve Balance**

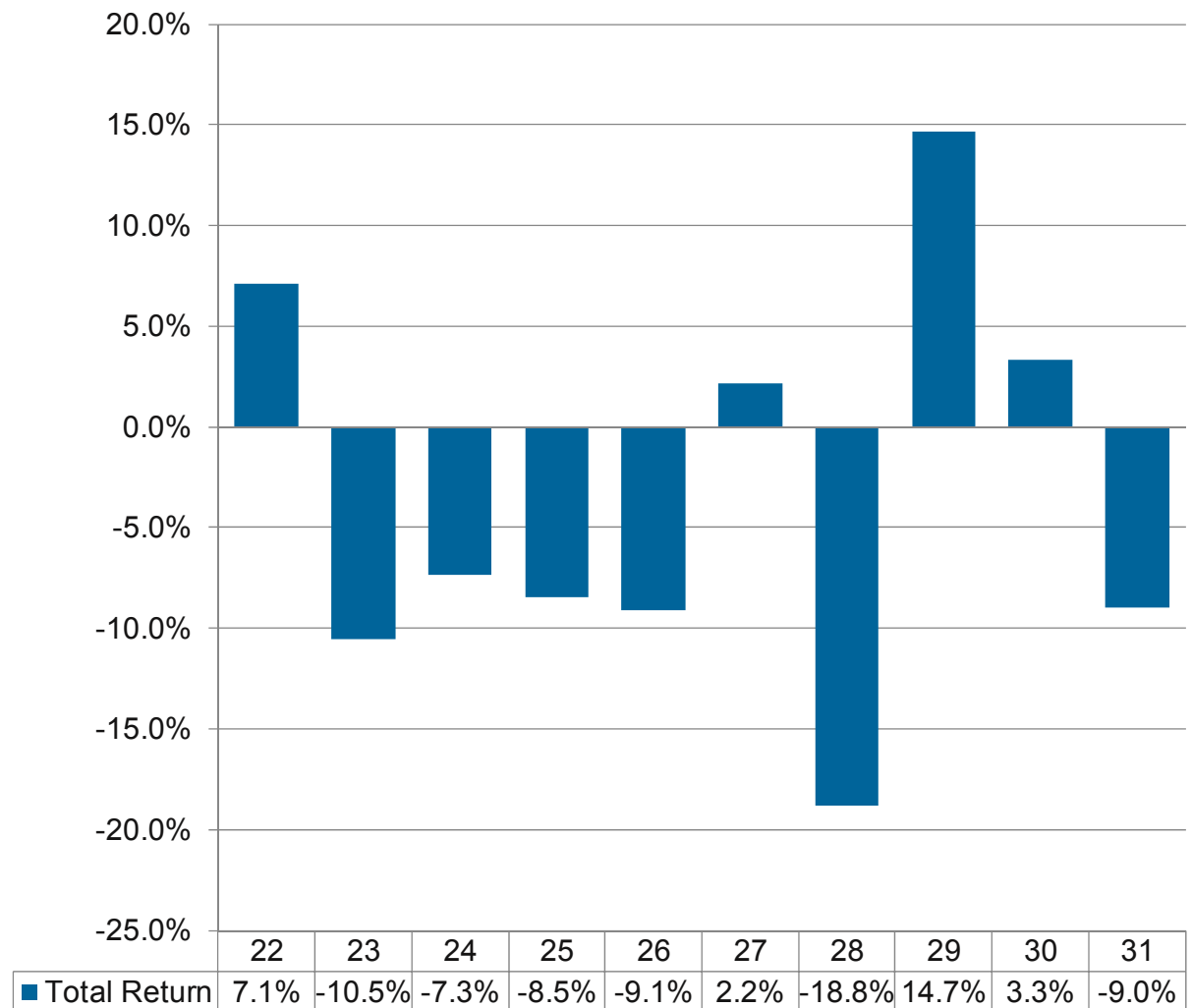


# Simulated Returns with Volatility

## 95th Percentile Tail Risk Scenario

- Bad outcomes for the ERA balance generally have multiple low or negative return years in a row and do not necessarily contain a “really bad” year.
- Large negative single years (like 2008) feel terrible, but the ERA is generally robust to those events as long as there is a recovery soon after.
- In this hypothetical scenario (“Trial 178”) the current ERA holds up pretty well until 2027 in spite of persistent negative returns in 23-26.

Trial #178 Annual Returns



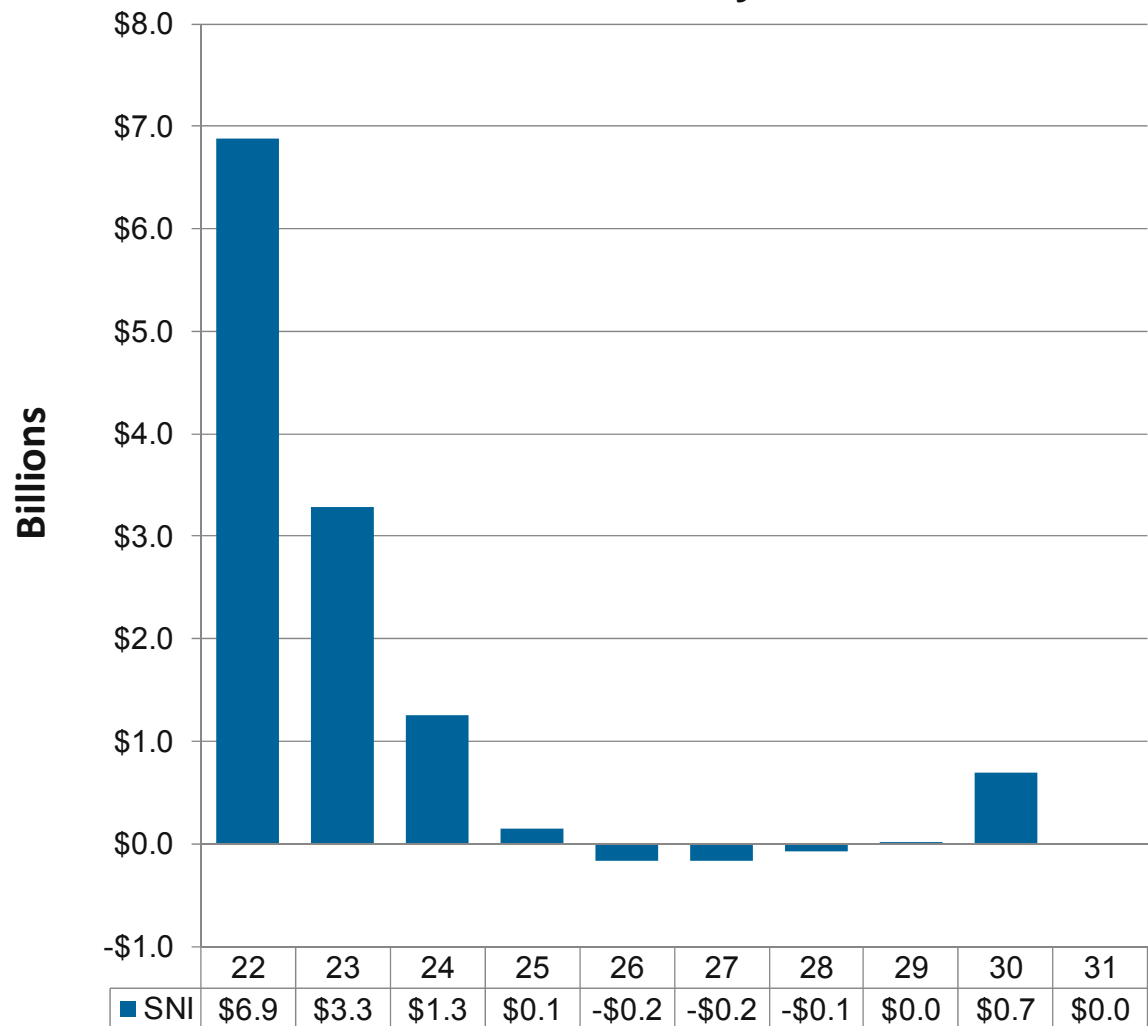


# Simulated Statutory Net Income with Volatility

## 95th Percentile Tail Risk Scenario

- High SNI in 2022 due to positive total return and current high unrealized gains.
- Negative returns in 2023-2025 (combined with gains realization from rebalancing and draws) wipes out current unrealized gains resulting in unrealized losses at total portfolio level.
- Turnover then results in net realized losses in 26, 27, 28 and 29.
- ERA balance is small relative to principal so ERA gets a small proportion of net realized losses (negative SNI) in 26, 27, and 28.

**Trial #178 Statutory Net Income**

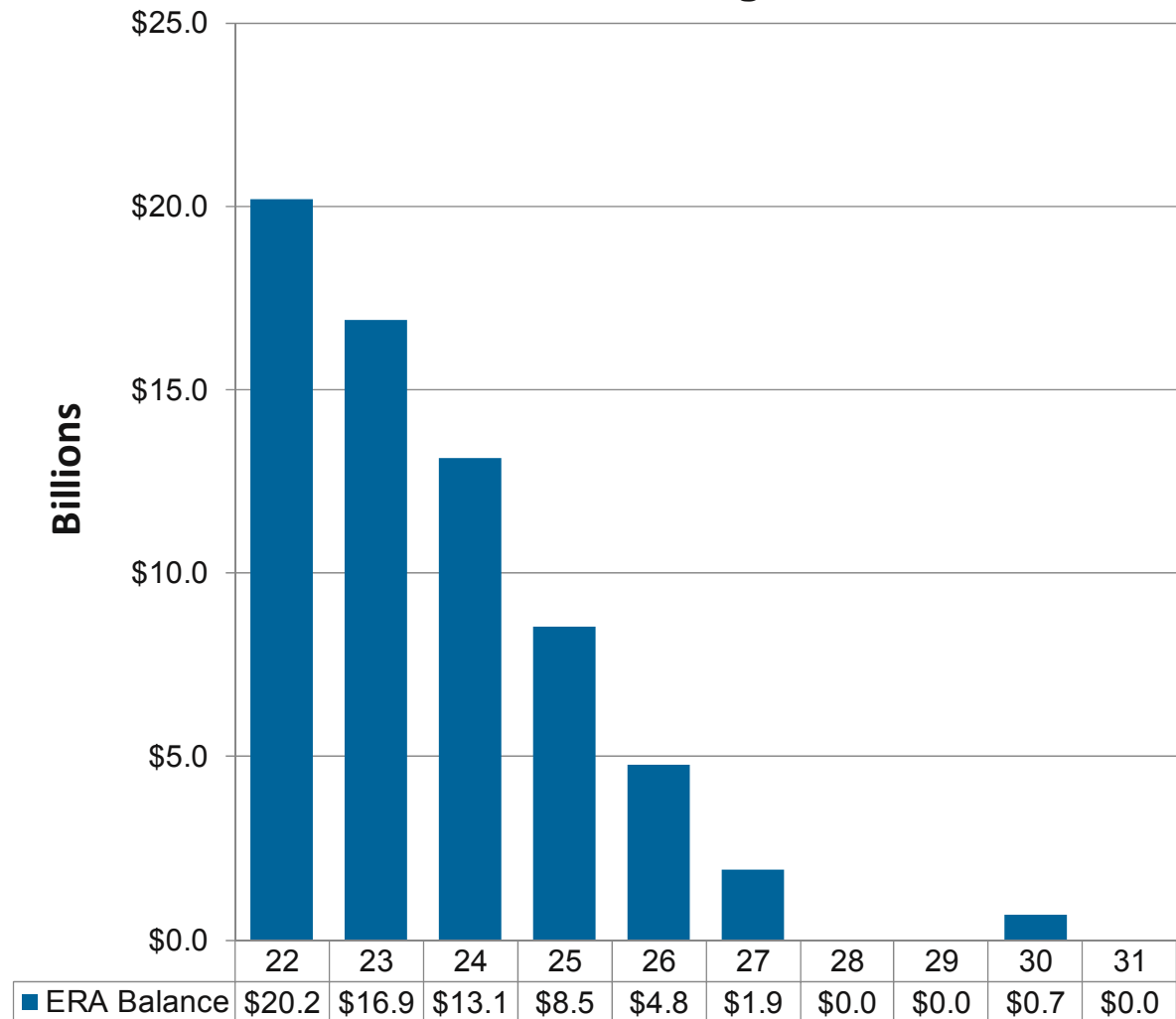


# Simulated Earnings Reserve Balance with Volatility

## 95th Percentile Tail Risk Scenario

- 2022 return slightly above median resulting in 2022 ERA being slightly above result on previous slide (so far so good).
- Declining SNI (due to gains realization and negative returns) combined with cumulative effect of POMV draw erodes ERA balance until it is exhausted in 2028.
- ERA balance remains at zero in 2029 due to zero SNI in that year.
- Slight positive SNI in 2030 bumps ERA up to about \$700 million in 2030.

**Trial #178 Earnings Reserve Balance**

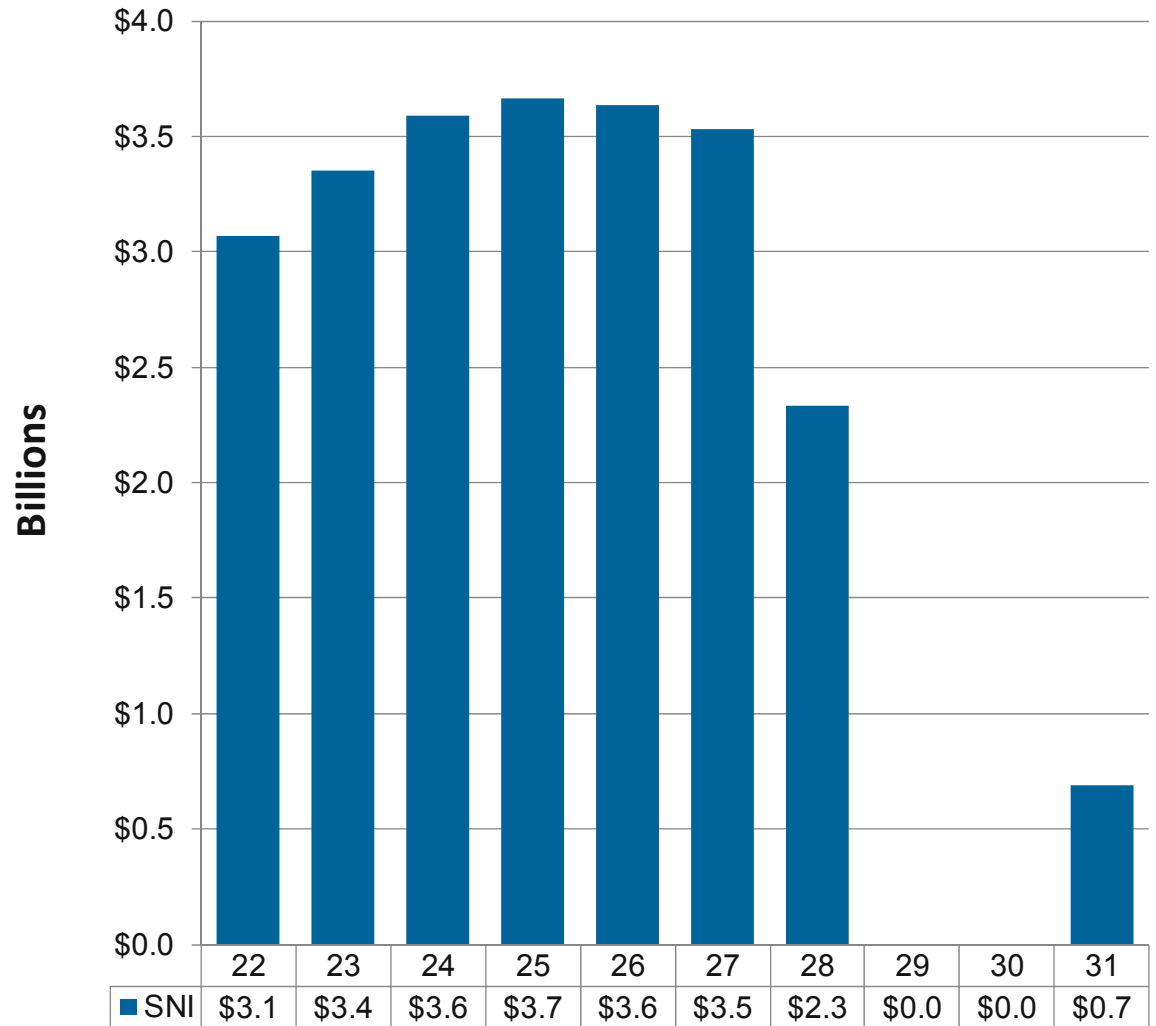


# Simulated POMV Distribution with Volatility

## 95th Percentile Tail Risk Scenario

- Current high ERA balance supports full POMV draw through 2027 in spite of declining SNI.
- Combination of zero SNI and zero starting ERA balances in 2028 and 2029 results in zero draws in 2029 and 2030.
- The positive draw in 2031 is equal to the total SNI generated in 2030 (ending ERA in 2030).
- Draw will continue to be equal to SNI in previous year until SNI exceeds POMV formula.

**Trial #178 POMV Distribution**



# Stress Testing the ERA and the POMV Spending Rule

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## Monte Carlo Simulation

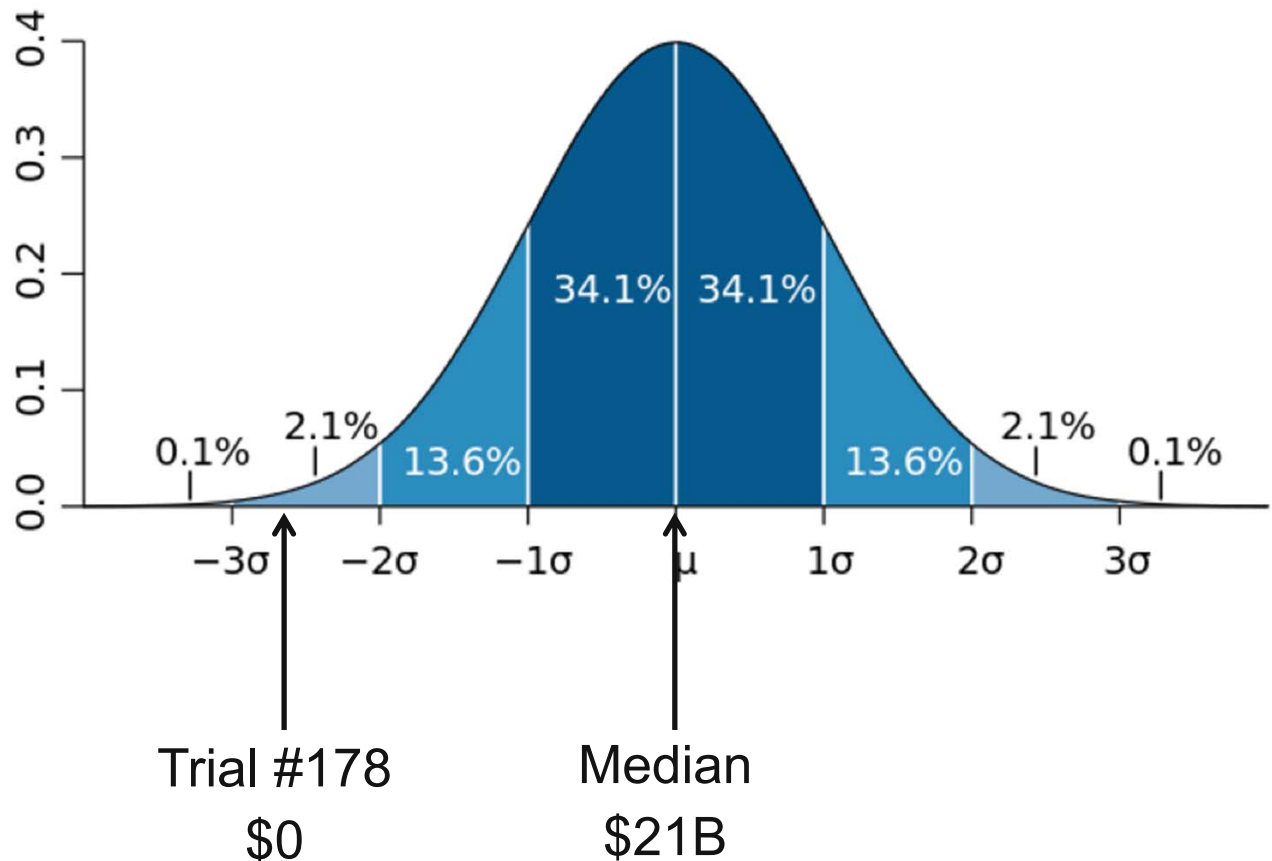
- Examine how resilient the Fund and the particularly the ERA are to varying levels of ad hoc draws.
- Tested four different ad hoc draw scenarios and compared them to the base case.
  - One-time ad hoc draw of \$1 billion in FY 2022
  - Ad hoc draws of \$1 billion in FY 2022 and 2023
  - Ad hoc draws of \$1 billion in FY 2022, 2023, and 2024
  - One-time ad hoc draw of \$5 billion in FY 2022
- 2000 simulations were run representing a full range of potential capital market outcomes.
- Asset allocation for the Fund was assumed to remain constant at the FY 2022 target.
  - 6.2% expected ten-year return;
  - 13.2% expected annualized standard deviation;
  - Gradually rising interest rates resulting in slightly lower distributions of returns in earlier years and higher distributions of returns in later years.
- Model tracked range of outcomes for variables including:
  - Market Value, Earnings Reserve Balance, Statutory Net Income, Distributions
- Output focuses on median and 95<sup>th</sup> percentile (1 in 20) worst case outcomes for each variable.

# Monte Carlo Simulation

## Range of Outcomes

- Simulation output describes range of possible outcomes for each variable with associated probabilities.
- 50% of outcomes are above median and 50% below.
- Probability of a \$24 billion balance is roughly 50% assuming POMV draw and no additional appropriations to principal.
- Probability of a zero ERA balance in 2028 is roughly 1.5%.

Range of Outcomes ERA Balance 2028

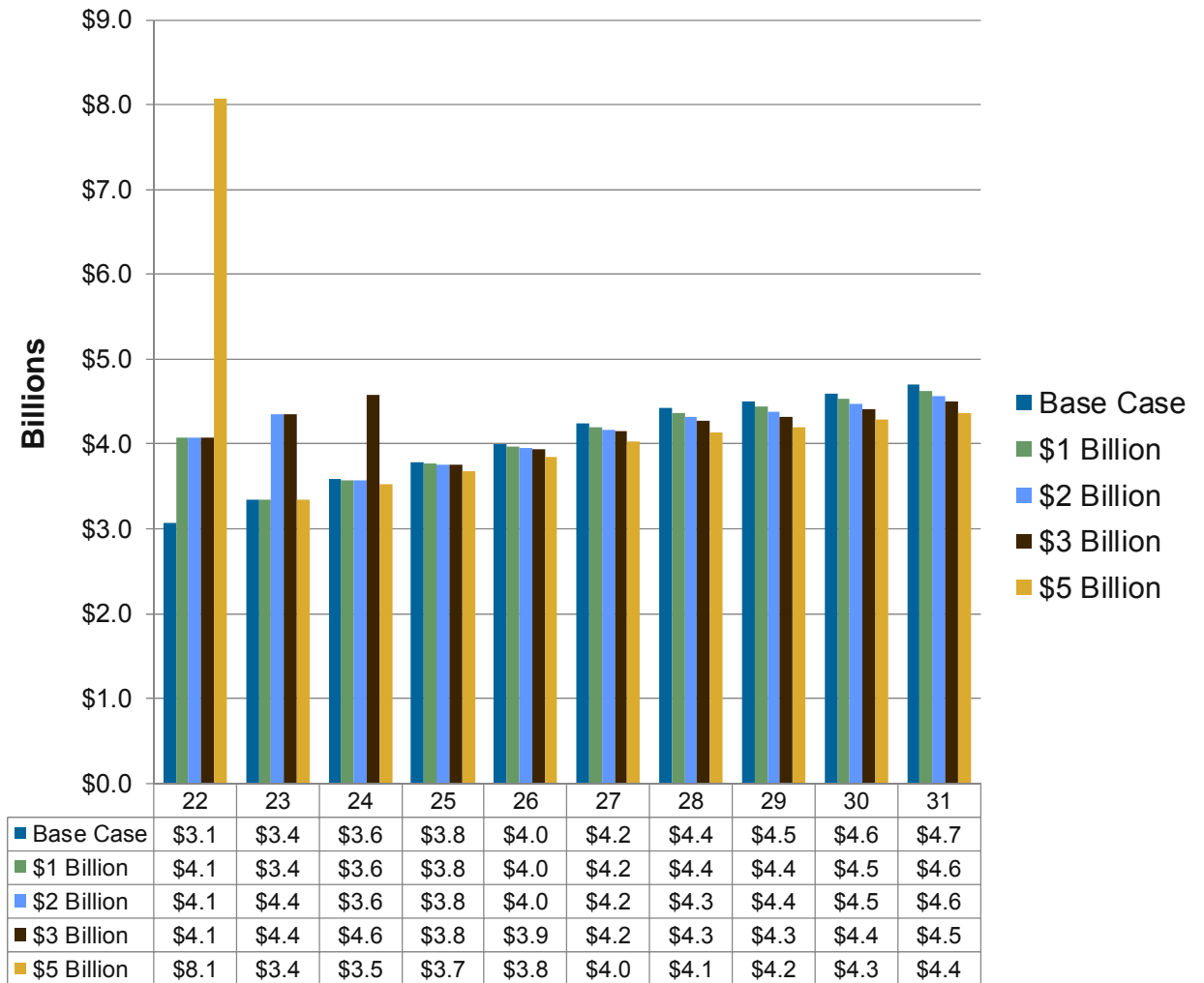


# Median Case Draws

## Stress Test Results

- Base Case is standard POMV formula.
- Draw gradually increases at a declining rate as recent outsized return years move out of rolling average.
- Alternative cases increase draw in early years, but modestly decrease draw in later years.
- This is due to the associated reduction in market value from the additional draw in early years.

Median Annual Draw

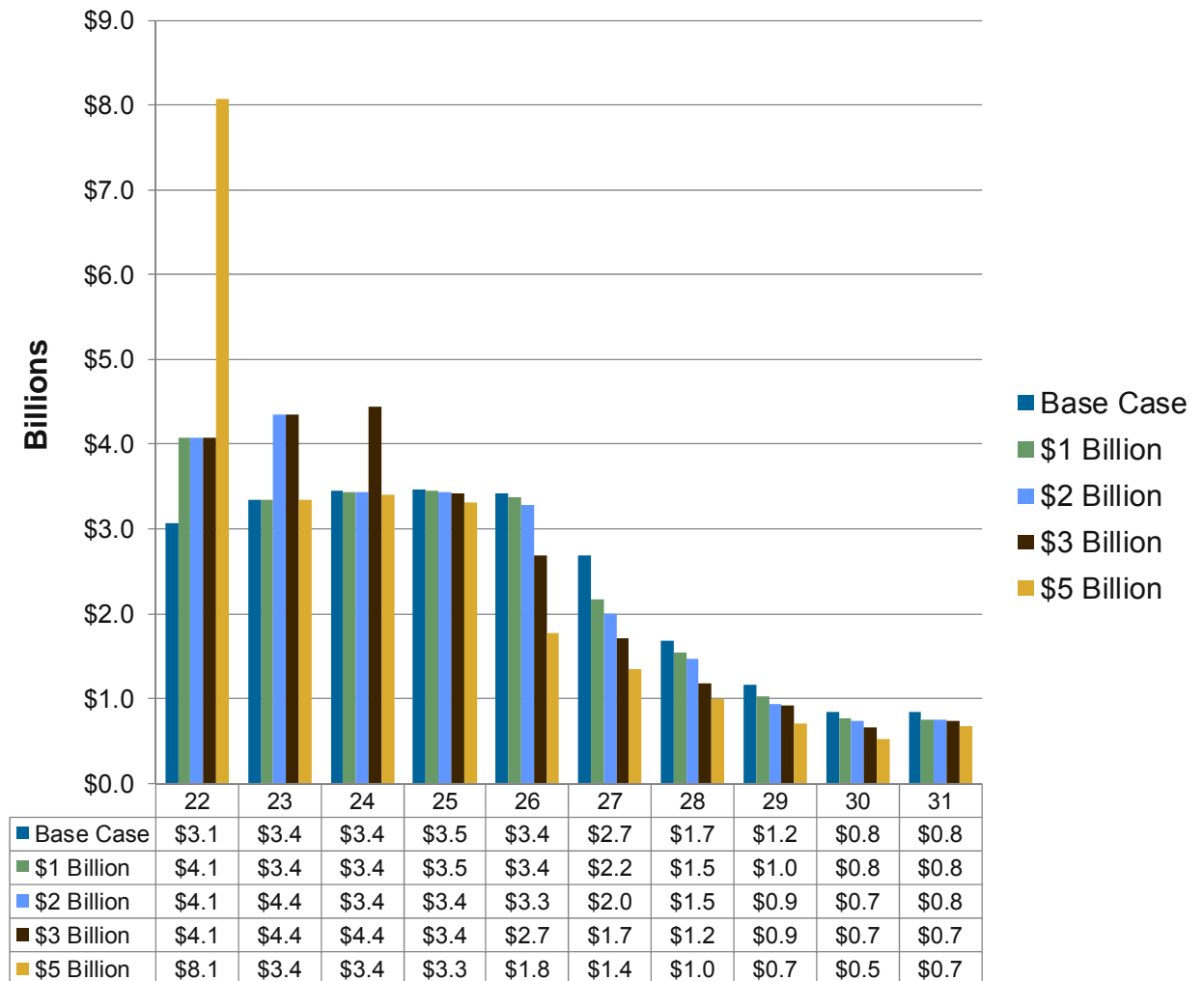


# 95<sup>th</sup> Percentile Worse Case Draws

## Stress Test Results

- 95<sup>th</sup> percentile worst case results are driven by low or negative returns.
- 2022 and 2023 draw is already determined based on POMV formula.
- All cases have a better than 95% chance of supporting the POMV draw in first two years.
- Base case holds up well in worst case through 2026.
- All cases have at least 5% chance of impaired draw beginning in 2027.
- Draw for \$5 billion case is roughly half of draw for base case beginning in 2027.

95th Percentile Annual Draw

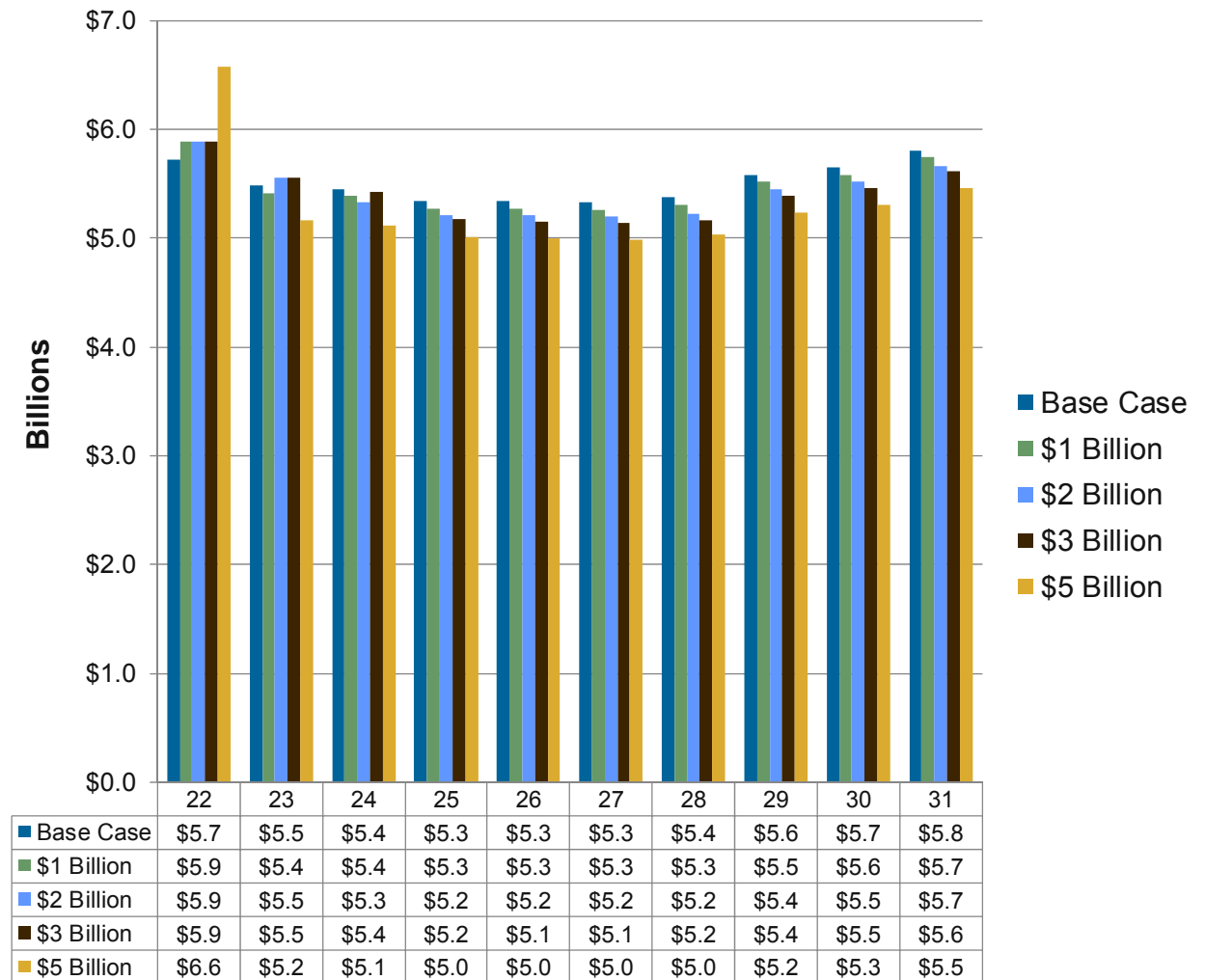


# Median Case Statutory Net Income

## Stress Test Results

- ad hoc draws actually increase SNI relative to base case in the year that they happen.
- This is due to the fact that a larger draw requires a larger asset sale resulting in higher realized gains.
- In later years the SNI is lower for the ad hoc draw cases due to lower market values and the early gains realization.
- SNI in median case is relatively similar across all cases.

Median Statutory Net Income



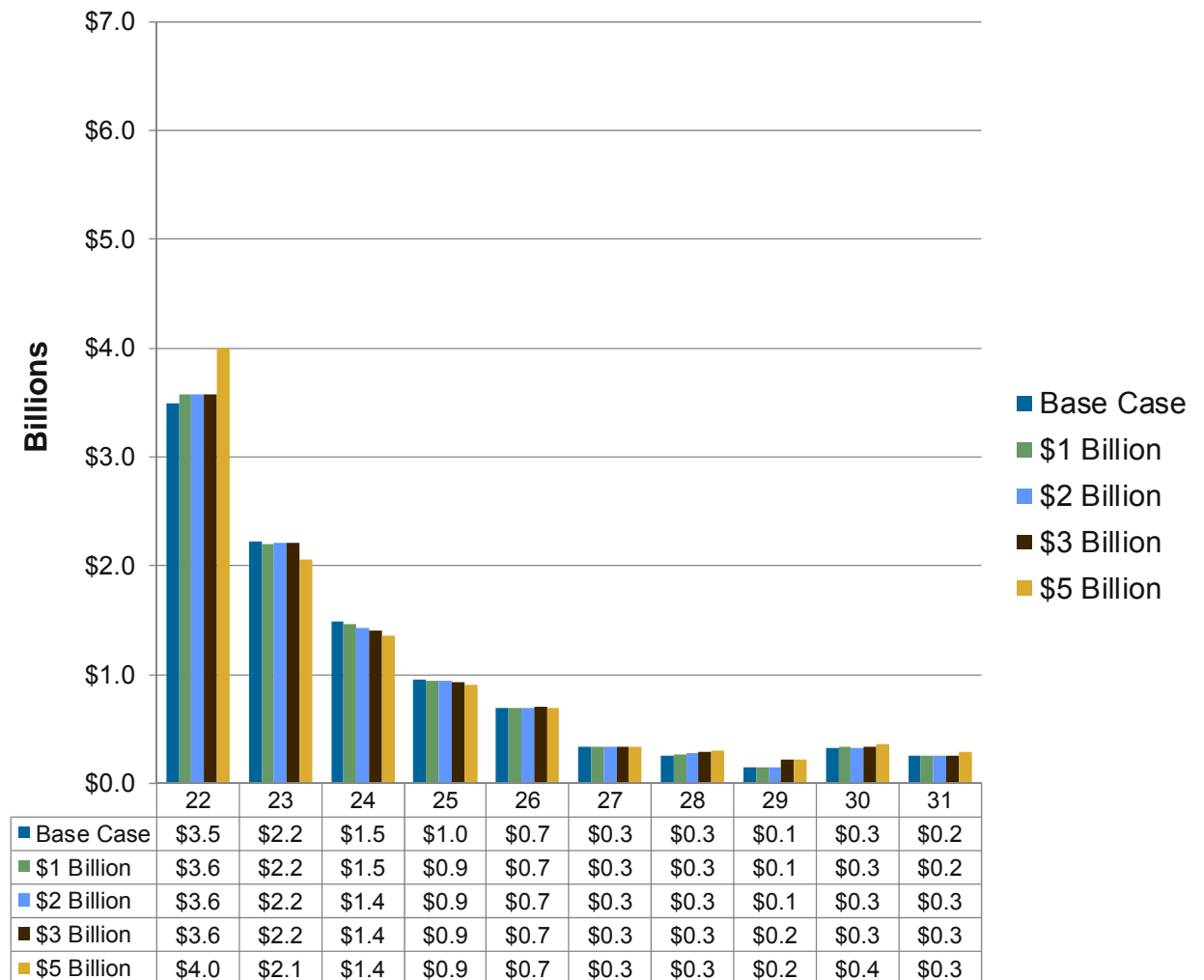


# 95<sup>th</sup> Percentile Worse Case Statutory Net Income

## Stress Test Results

- As with the median outcome ad hoc draws increase SNI in the 95<sup>th</sup> percentile case in the year that they happen due to increased gains realization to fund the bigger draws.
- 95<sup>th</sup> percentile SNI outcomes are relatively similar across all cases in all years of the projection.

95th Percentile Statutory Net Income

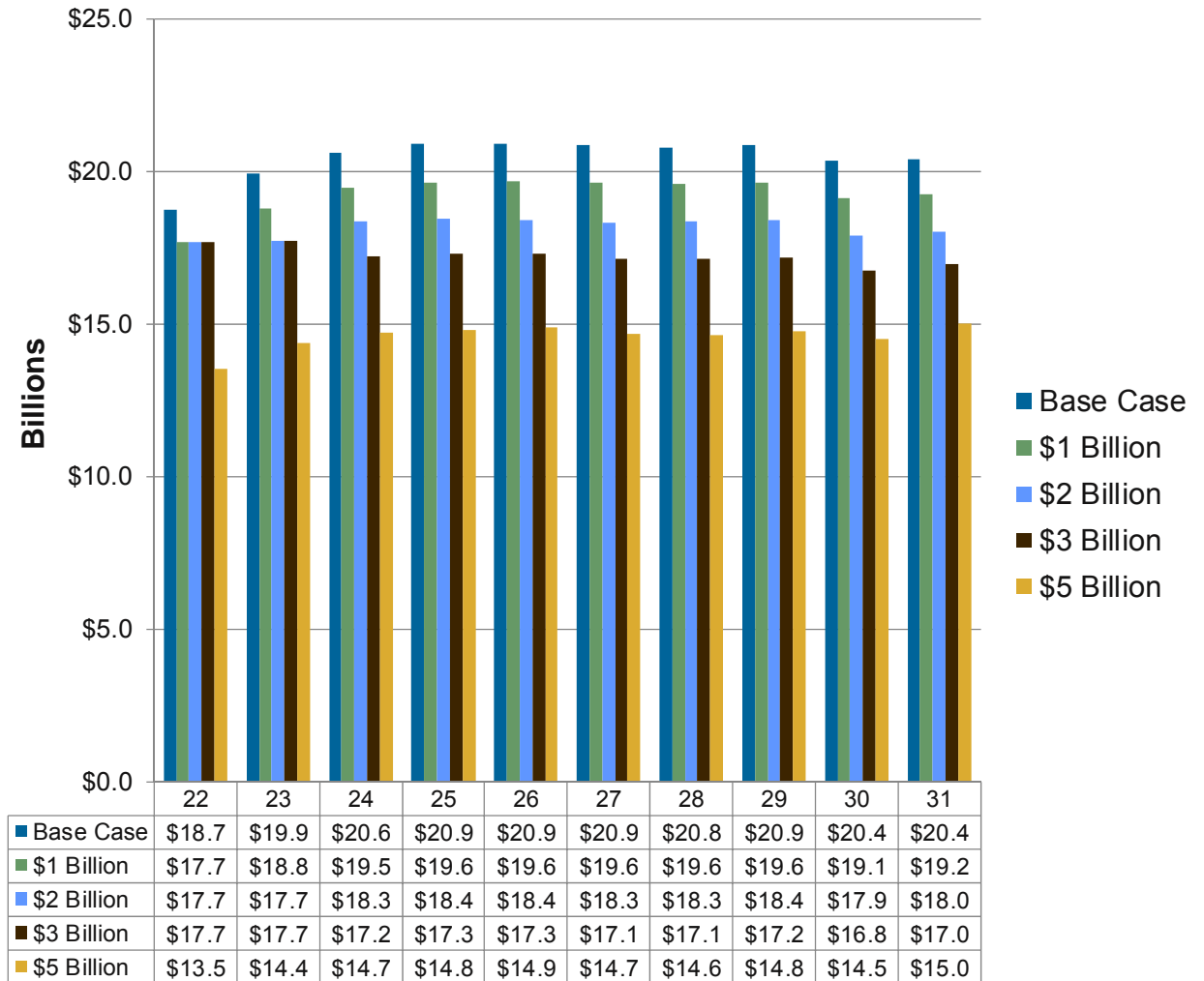


# Median Earnings Reserve Account Balances

## Stress Test Results

- Ad hoc draws result in immediate reductions in ERA balance in the year that they happen.
- Median ERA balances for all ad hoc draw cases are lower than the base case in all years of the projection.
- ERA balances relatively stable after 2026 for all cases reflecting sustainability of POMV spending rule.

Median Earnings Reserve Balance

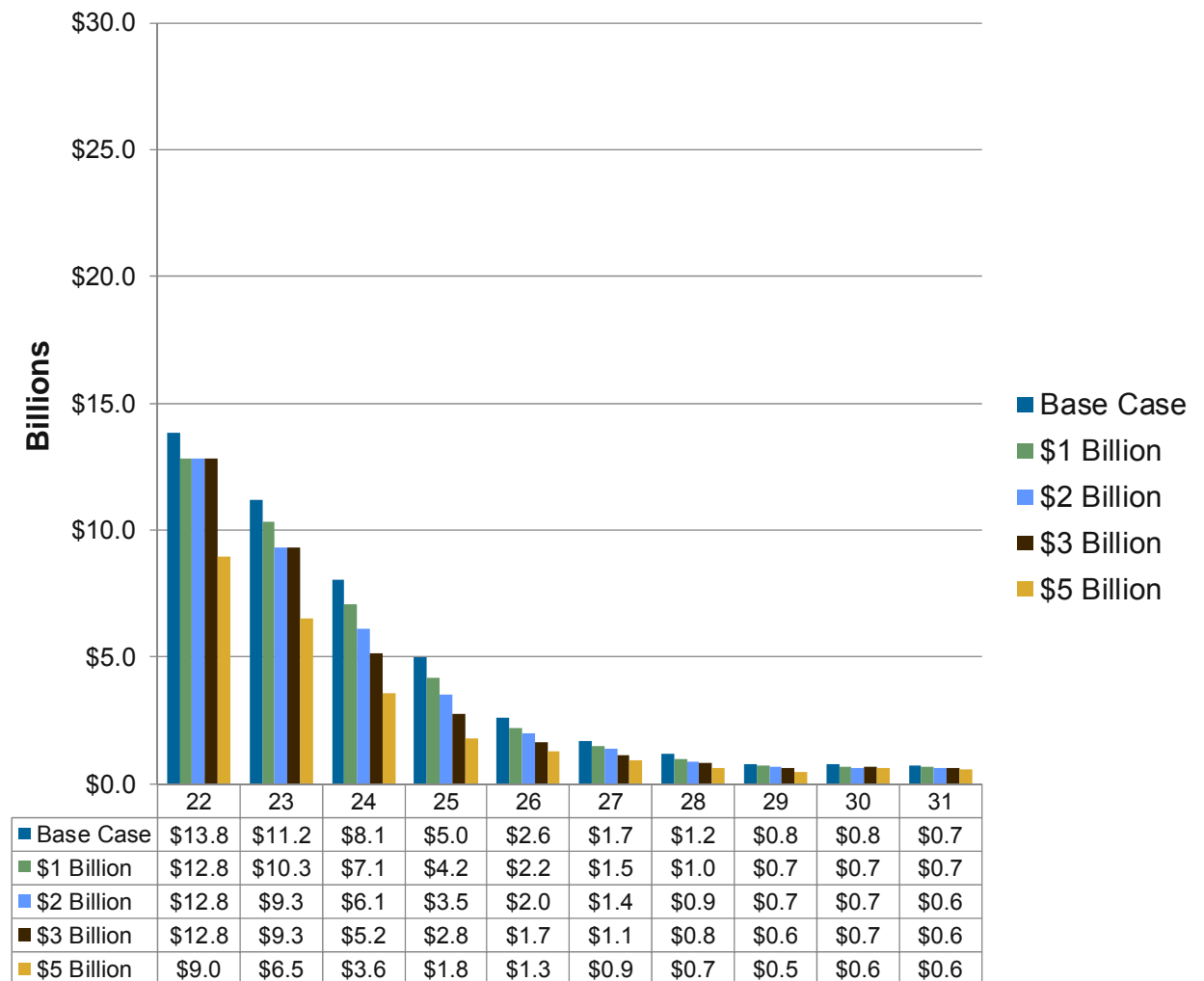


# 95<sup>th</sup> Percentile Earnings Reserve Account Balances

## Stress Test Results

- 95<sup>th</sup> Percentile ERA balances are generally lower for ad hoc draw cases than base case.
- 95<sup>th</sup> percentile ERA balances are significantly below median balances for all cases.
- Differences between cases get smaller in out years as negative returns impact all cases.
- Ad hoc draw cases hit ERA spending limits in earlier years which ultimately equalizes ERA balances in later years in worse case outcomes.

95th Percentile Earnings Reserve Balance

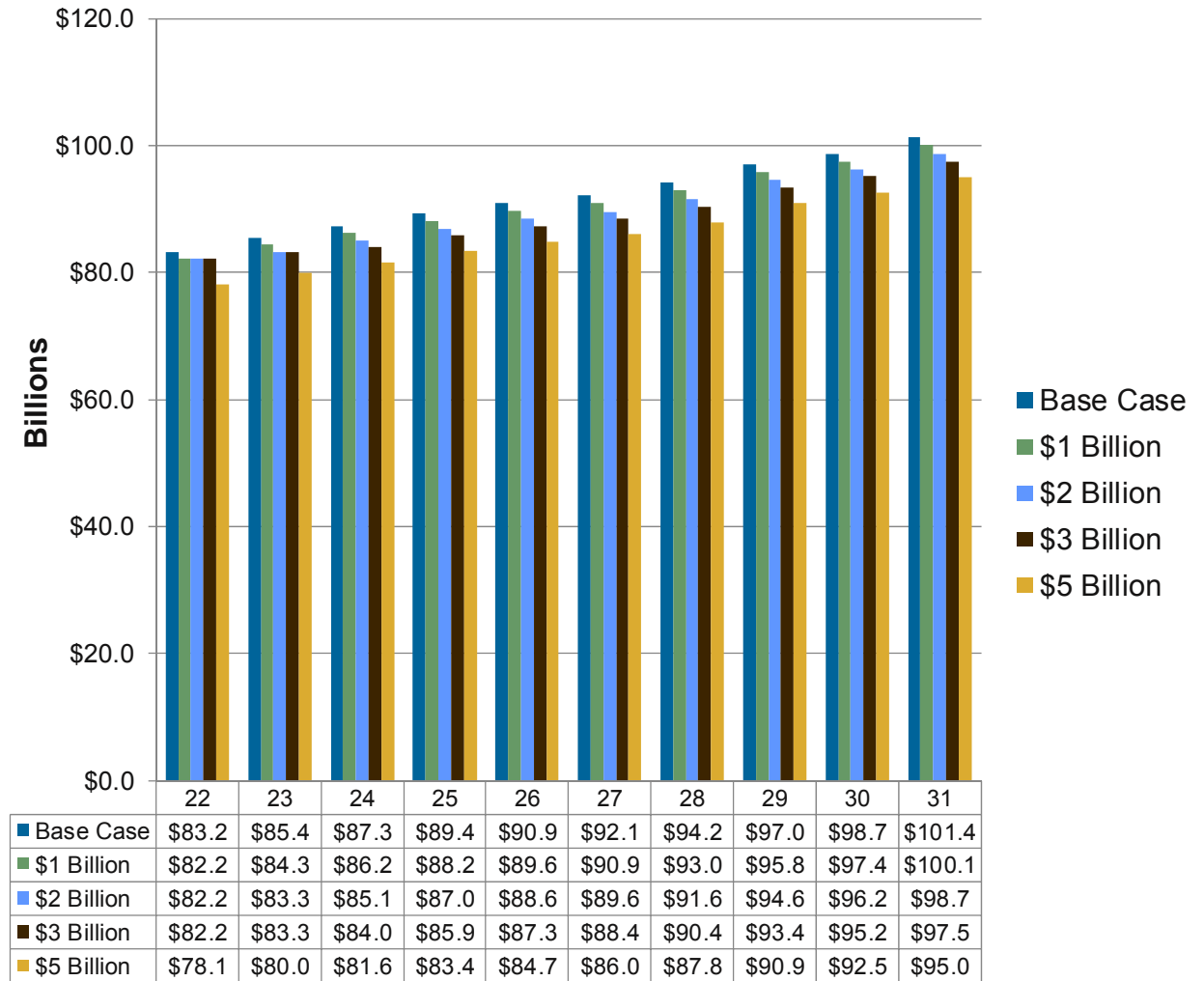


# Median Ending Market Value

## Stress Test Results

- Impact of ad hoc draws on median market value is relatively straightforward.
- In the median case the returns are generally positive which means that the differences in market value compound over time.
- This results in a larger difference in market value in year 10 than the size of the original draw.

Median Ending Market Value

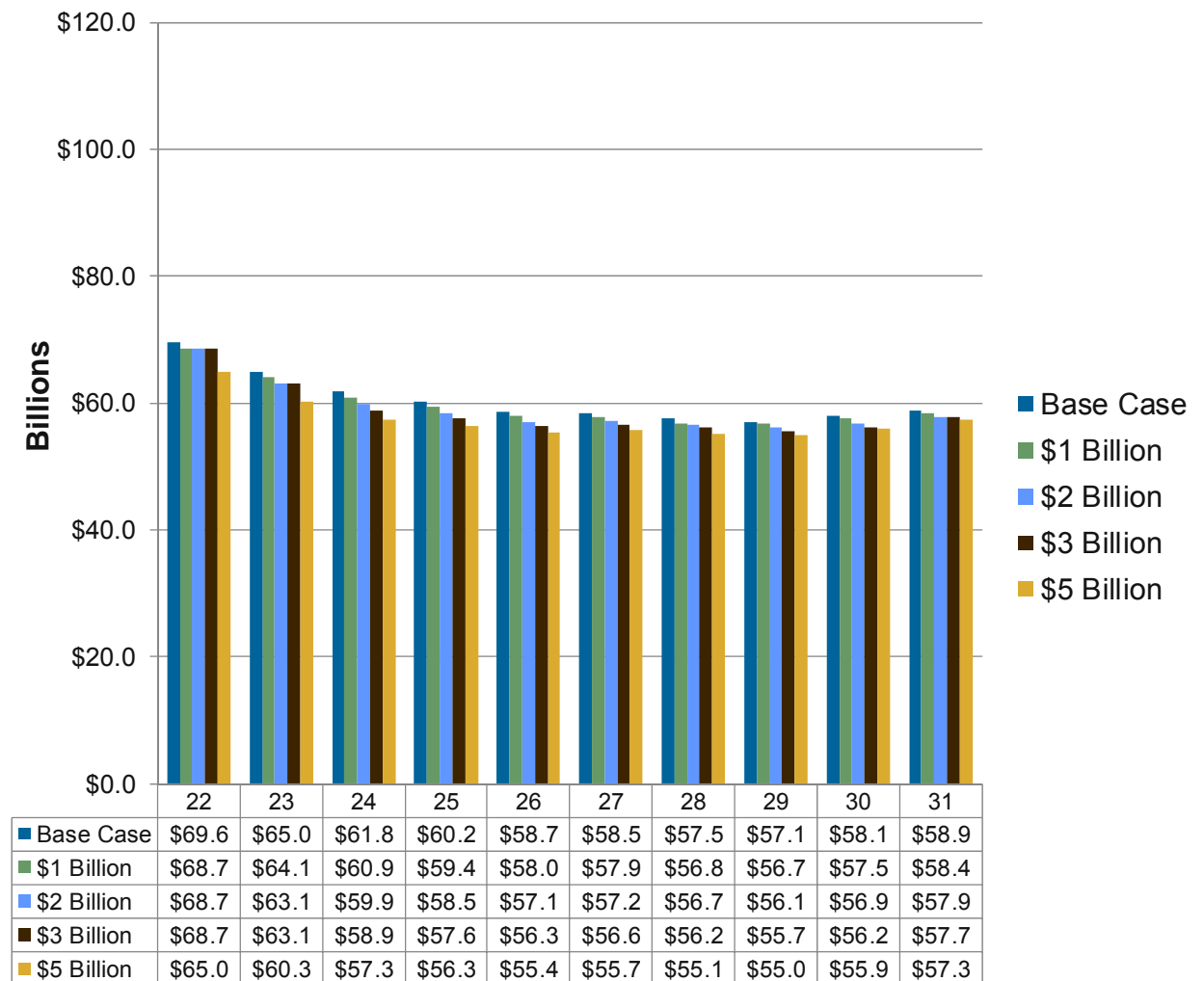


# 95<sup>th</sup> Percentile Ending Market Value

## Stress Test Results

- In worse case (negative return) outcomes the smaller market value created by the ad hoc draws actually results in slightly smaller dollar losses (same percentage).
- This means that the differences in the first year ending market values is actually modestly smaller than the size of the ad hoc draws.
- Adding inflation proofing in 2023 and 2024 modestly improves worst-case EMV outcomes (relative to December BOT analysis) due to spending limits kicking in earlier.

95th Percentile Ending Market Value



# Range of Outcomes – Probability of Shortfall by Year

## Stress Test Results

- Another perspective is the probability of a shortfall in each year.
- A shortfall is defined as the difference between the allowable draw and the prescribed POMV draw.
- In the base case it isn't until year 2026 that we observe any probability of a shortfall.
- As the size of the ad hoc draw increases the probability of a shortfall in each year goes up (in spite of the POMV draws being modestly lower due to lower EMV).
- The \$5 billion case has an 11% probability of a shortfall in 2026.

Year	Base Case	\$1 Billion	\$2 Billion	\$3 Billion	\$5 Billion
2022	0%	0%	0%	0%	0%
2023	0%	0%	0%	0%	0%
2024	0%	0%	0%	0%	1%
2025	0%	1%	1%	2%	5%
2026	3%	4%	5%	7%	11%
2027	7%	8%	10%	12%	15%
2028	10%	12%	13%	15%	17%
2029	14%	15%	17%	18%	20%
2030	15%	16%	17%	18%	19%
2031	17%	18%	18%	19%	21%

# Range of Outcomes – Cumulative Shortfall over Ten Years

## Stress Test Results

- Cumulative shortfall is a measure of the sum of the differences between the POMV prescribed draw and the actual draw.
- In years when the ERA balance is insufficient to support the POMV draw there is a shortfall.
- The base case has at least a 20% probability of generating a shortfall during the ten-year projection period
- The \$5 billion case has at least a 30% chance of generating a shortfall.
- The size and probability of the cumulative shortfall increases with the size of the ad hoc draw

10 Year Total Cumulative Shortfall (\$Billions)					
Percentile	Base Case	\$1 Billion	\$2 Billion	\$3 Billion	\$5 Billion
5%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
10%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
15%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
20%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
25%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
30%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
35%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
40%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
45%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
50%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
55%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
60%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
65%	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
70%	\$0.00	\$0.00	\$0.00	\$0.20	\$1.00
75%	\$0.06	\$0.45	\$0.76	\$1.22	\$2.03
80%	\$1.32	\$1.71	\$2.13	\$2.52	\$3.28
85%	\$2.67	\$3.03	\$3.35	\$3.88	\$4.55
90%	\$4.35	\$4.79	\$5.16	\$5.67	\$6.49
95%	\$7.09	\$7.32	\$7.86	\$8.18	\$8.77

# Range of Outcomes – Year 10 Distribution

## Stress Test Results

- This variable is the nominal value of the distribution in year 10 of the projection.
- The higher the ad hoc draw the lower the distribution in year 10.
- This is true across all cases from 5<sup>th</sup> through 95<sup>th</sup> percentile.
- The better the capital market outcome the larger the dollar difference in the year 10 distribution.
- The \$5 billion ad hoc draw case reduces the median year-10 distribution by roughly \$330 million relative to the base case.

Year 10 Distribution (\$000's)					
Percentile	Base Case	\$1 Billion	\$2 Billion	\$3 Billion	\$5 Billion
5%	\$7,601,888	\$7,495,344	\$7,398,380	\$7,308,849	\$7,088,535
10%	\$6,911,424	\$6,833,880	\$6,758,468	\$6,677,833	\$6,474,898
15%	\$6,447,855	\$6,364,816	\$6,288,585	\$6,217,730	\$6,023,308
20%	\$6,089,187	\$6,015,113	\$5,946,400	\$5,875,432	\$5,703,342
25%	\$5,777,906	\$5,695,559	\$5,625,334	\$5,557,168	\$5,391,148
30%	\$5,519,803	\$5,444,653	\$5,371,382	\$5,304,360	\$5,147,077
35%	\$5,299,518	\$5,225,813	\$5,160,229	\$5,096,856	\$4,929,333
40%	\$5,081,671	\$5,016,770	\$4,952,944	\$4,887,256	\$4,740,194
45%	\$4,873,909	\$4,811,036	\$4,742,371	\$4,680,933	\$4,548,284
50%	\$4,688,727	\$4,625,322	\$4,556,274	\$4,499,755	\$4,357,289
55%	\$4,475,931	\$4,422,223	\$4,360,478	\$4,302,510	\$4,178,752
60%	\$4,301,823	\$4,240,205	\$4,190,768	\$4,132,183	\$4,012,052
65%	\$4,146,956	\$4,086,056	\$4,029,632	\$3,969,616	\$3,852,413
70%	\$3,946,260	\$3,890,126	\$3,834,840	\$3,782,249	\$3,682,951
75%	\$3,782,766	\$3,718,994	\$3,659,654	\$3,596,387	\$3,463,440
80%	\$3,508,512	\$3,439,281	\$3,370,691	\$3,302,688	\$3,114,883
85%	\$3,009,043	\$2,903,089	\$2,839,142	\$2,717,422	\$2,533,678
90%	\$1,998,922	\$1,945,514	\$1,887,196	\$1,793,750	\$1,651,434
95%	\$837,222	\$752,414	\$750,286	\$739,577	\$682,951



# Range of Outcomes – Cumulative Distributions over 10 Years

## Stress Test Results

- This variable sums all of the distributions, both ad hoc and POMV, over the first ten years of the projection period.
- Total cumulative distributions are higher across the full range of outcomes for the ad hoc draw cases relative to the base case.
- Total cumulative distributions increase with the size of the ad hoc draw.
- The increase in total cumulative distributions is smaller than the size of the ad hoc draw in all cases.
- A higher draw in early years results in lower draws in later years due to lower EMV.

10-Year Total Cumulative Distribution (\$000's)					
Percentile	Base Case	\$1 Billion	\$2 Billion	\$3 Billion	\$5 Billion
5%	\$51,530,869	\$52,100,984	\$52,672,920	\$53,395,615	\$54,136,834
10%	\$48,723,301	\$49,302,499	\$49,966,403	\$50,692,984	\$51,543,685
15%	\$47,225,134	\$47,808,265	\$48,435,450	\$49,142,952	\$50,031,636
20%	\$45,755,490	\$46,350,801	\$47,016,256	\$47,700,576	\$48,635,739
25%	\$44,500,380	\$45,091,645	\$45,755,672	\$46,473,986	\$47,483,244
30%	\$43,526,173	\$44,132,638	\$44,820,921	\$45,530,560	\$46,507,343
35%	\$42,671,071	\$43,307,789	\$43,991,656	\$44,724,609	\$45,780,737
40%	\$41,879,293	\$42,476,140	\$43,159,239	\$43,910,427	\$44,981,533
45%	\$41,094,118	\$41,707,547	\$42,397,095	\$43,127,589	\$44,166,752
50%	\$40,249,421	\$40,820,863	\$41,514,311	\$42,250,060	\$43,342,578
55%	\$39,436,461	\$40,069,511	\$40,678,499	\$41,368,251	\$42,475,280
60%	\$38,631,843	\$39,267,782	\$39,948,986	\$40,645,374	\$41,680,161
65%	\$37,857,109	\$38,462,043	\$39,075,607	\$39,756,509	\$40,721,647
70%	\$36,975,019	\$37,566,366	\$38,229,149	\$38,778,895	\$39,785,213
75%	\$35,887,206	\$36,431,040	\$37,070,794	\$37,646,406	\$38,386,708
80%	\$34,612,124	\$35,039,318	\$35,554,688	\$35,922,567	\$36,551,417
85%	\$32,859,224	\$33,271,258	\$33,624,675	\$34,017,966	\$34,588,043
90%	\$30,357,806	\$30,631,579	\$31,092,842	\$31,344,911	\$32,191,139
95%	\$26,723,619	\$27,020,913	\$27,467,298	\$27,717,033	\$28,586,940

# Range of Outcomes – Year 10 Market Value

## Stress Test Results

- This variable is the market value of the fund at the end of the 10<sup>th</sup> year of the projection.
- The larger the ad hoc draw the lower the ending market value in year 10.
- This is true across all outcomes from 5<sup>th</sup> through 95<sup>th</sup> percentile.
- The dollar difference in year 10 market value between the base case and ad hoc cases is larger than the size of the ad hoc draw for all outcomes better than the 60<sup>th</sup> percentile (i.e. over 60% of outcomes).

Year 10 EMV (\$000's)					
Percentile	Base Case	\$1 Billion	\$2 Billion	\$3 Billion	\$5 Billion
5%	\$184,916,411	\$182,319,142	\$180,283,092	\$178,398,247	\$173,422,737
10%	\$162,660,912	\$160,662,540	\$158,999,865	\$157,311,794	\$152,604,606
15%	\$148,165,642	\$146,322,043	\$144,552,035	\$142,379,362	\$138,047,367
20%	\$135,853,061	\$134,220,041	\$132,650,228	\$130,788,379	\$127,202,018
25%	\$127,801,364	\$126,334,534	\$124,561,596	\$123,110,473	\$119,663,056
30%	\$121,798,675	\$120,309,420	\$118,878,028	\$117,513,675	\$114,064,268
35%	\$116,528,252	\$115,189,427	\$113,530,852	\$112,160,358	\$109,388,637
40%	\$110,230,133	\$108,877,675	\$107,963,191	\$106,432,868	\$103,678,839
45%	\$105,766,432	\$104,317,621	\$102,915,055	\$101,624,646	\$99,159,285
50%	\$101,401,599	\$100,118,522	\$98,729,683	\$97,452,209	\$95,033,971
55%	\$97,219,633	\$96,064,637	\$94,822,746	\$93,538,755	\$91,405,254
60%	\$93,032,361	\$91,864,051	\$90,805,548	\$89,947,186	\$87,957,462
65%	\$88,797,182	\$87,825,188	\$86,942,967	\$85,846,703	\$83,812,201
70%	\$84,414,262	\$83,481,516	\$82,497,610	\$81,662,116	\$80,036,611
75%	\$80,856,577	\$80,071,492	\$79,293,379	\$78,524,890	\$76,660,450
80%	\$76,944,787	\$76,062,315	\$75,132,687	\$74,428,417	\$72,945,218
85%	\$71,642,708	\$71,085,814	\$70,287,196	\$69,481,525	\$68,482,471
90%	\$66,045,102	\$65,335,647	\$64,877,855	\$64,450,050	\$63,884,214
95%	\$58,856,393	\$58,430,619	\$57,873,109	\$57,706,391	\$57,301,706

# Range of Outcomes – Year 10 Statutory Net Income

## Stress Test Results

- This variable is the Statutory Net Income generated in the 10<sup>th</sup> year of the projection.
- In all outcomes above the 95<sup>th</sup> percentile the ad hoc draws result in lower statutory net income than the base case.
- The reduction in SNI increases with the size of the ad hoc draw.
- The reduction in SNI is greater in the better capital market outcomes due to the impact of compounding.

Year 10 Statutory Net Income (\$000's)					
Percentile	Base Case	\$1 Billion	\$2 Billion	\$3 Billion	\$5 Billion
5%	\$17,568,831	\$17,335,512	\$17,122,671	\$16,912,585	\$16,481,665
10%	\$13,558,707	\$13,381,130	\$13,193,407	\$13,038,650	\$12,670,856
15%	\$11,718,329	\$11,571,477	\$11,443,832	\$11,325,297	\$10,972,102
20%	\$10,293,063	\$10,152,717	\$10,035,151	\$9,926,941	\$9,602,408
25%	\$9,179,646	\$9,054,378	\$8,956,229	\$8,870,733	\$8,621,692
30%	\$8,268,793	\$8,172,982	\$8,072,679	\$7,974,579	\$7,771,150
35%	\$7,611,348	\$7,518,878	\$7,429,418	\$7,354,362	\$7,137,474
40%	\$6,861,816	\$6,787,521	\$6,709,815	\$6,639,139	\$6,454,811
45%	\$6,303,666	\$6,217,484	\$6,159,903	\$6,085,807	\$5,912,920
50%	\$5,801,901	\$5,737,330	\$5,665,668	\$5,609,904	\$5,454,311
55%	\$5,200,353	\$5,130,947	\$5,067,690	\$5,024,377	\$4,919,362
60%	\$4,645,808	\$4,586,098	\$4,527,364	\$4,480,194	\$4,369,959
65%	\$4,042,157	\$3,996,395	\$3,957,229	\$3,908,352	\$3,811,163
70%	\$3,563,145	\$3,520,952	\$3,476,502	\$3,433,130	\$3,349,265
75%	\$3,081,337	\$3,056,473	\$3,028,053	\$2,984,157	\$2,920,580
80%	\$2,587,714	\$2,574,367	\$2,539,109	\$2,511,611	\$2,458,449
85%	\$2,008,210	\$1,981,428	\$1,998,256	\$1,957,814	\$1,925,660
90%	\$1,141,052	\$1,128,758	\$1,116,373	\$1,104,706	\$1,094,876
95%	\$249,960	\$249,722	\$252,942	\$254,093	\$286,487

# Conclusions from Stress Test

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## Summary Observations

- Generally speaking, relative to the base case ad hoc draws are expected to:
  - Reduce future Market Values;
  - Reduce future Statutory Net Income;
  - Reduce future POMV Distributions;
  - Reduce the future Earnings Reserve Balance;
  - Increase the probability of shortfalls relative to the POMV formula.
- The current size of the ERA balance combined with the high levels of unrealized gains makes the ERA relatively robust to ad hoc draws over the next three to five years.
- Over longer periods larger ad hoc draws result in smaller ERA balances which means greater probability of impaired distributions in future years.
- Under the \$5 billion ad hoc draw case the ERA is expected to be able to support the POMV formula through 2025 (albeit with lower POMV amounts due to the lower market value).
- After 2026, the \$5 billion ad hoc draw increases the probability of impaired distributions to 10% in 2027, and to 19% by 2031.
- Total cumulative distributions over the ten year projection period are generally higher for the ad hoc draw cases, but by less than the amount of the ad hoc draws.



## Appendix

Capital Market Projections  
Q4 Index Performance

# Capital Market Projections

## Projected Return, Standard Deviation, and Yield

### Summary of Callan's Long-Term Capital Market Projections for APFC Asset Allocation Model (FY 2022 - 2031)

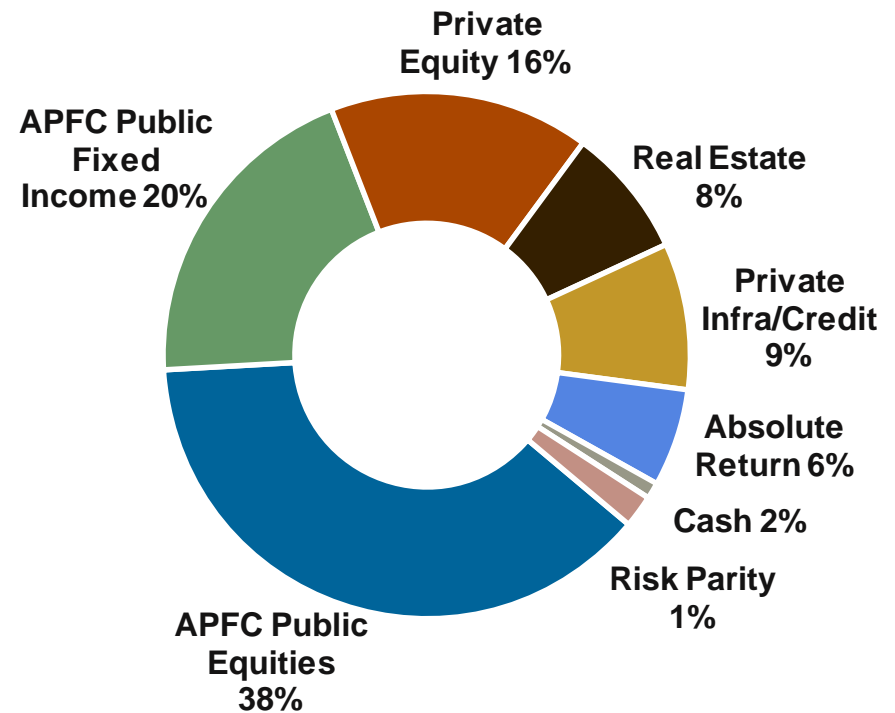
Asset Class	Performance Index	FY 2021 Target Weight	PROJECTED RETURN		PROJECTED RISK	
			1-Year Arithmetic	10-Year Geometric Return	Annualized Standard Deviation	Projected Yield
<b>APFC Public Equities</b>		<b>38.00%</b>	<b>8.30%</b>	<b>6.85%</b>	<b>18.30%</b>	<b>2.40%</b>
Global Equity	MSCI ACWI - IMI	38.00%	8.30%	6.85%	18.30%	2.40%
<b>APFC Public Fixed Income</b>		<b>20.00%</b>	<b>2.25%</b>	<b>2.20%</b>	<b>3.75%</b>	<b>3.05%</b>
Money Markets	90-Day T-Bill	1.00%	1.00%	1.00%	0.90%	1.00%
TIPS	Bloomberg TIPS	1.00%	1.80%	1.70%	5.05%	2.35%
US Fixed Income	Bloomberg Aggregate	5.50%	1.80%	1.75%	3.75%	2.50%
US Investment Grade Credit	Bloomberg Credit	5.50%	2.30%	2.25%	4.25%	2.85%
Non-US Fixed Income	Bloomberg Global Treasury ex-US Hedged	2.00%	1.15%	0.75%	9.20%	1.80%
Emerging Market Debt	50/50 JPM EMBI/JPM GBI	1.00%	3.90%	3.50%	9.50%	5.95%
High Yield	Bloomberg US High Yield 2% Issuer Cap	2.00%	4.85%	4.35%	10.75%	6.70%
US Securitized	Bloomberg US Securitized	2.00%	2.00%	1.95%	4.00%	2.60%
<b>Private Equity/Growth Opps</b>		<b>16.00%</b>	<b>11.50%</b>	<b>8.00%</b>	<b>27.80%</b>	<b>0.00%</b>
Private Equity	Cambridge Private Equity (lag)	16.00%	11.50%	8.00%	27.80%	0.00%
<b>Private Real Estate</b>		<b>8.00%</b>	<b>6.60%</b>	<b>5.75%</b>	<b>14.10%</b>	<b>4.40%</b>
Real Estate	NCREIF Total Index (lag)	8.00%	6.60%	5.75%	14.10%	4.40%
<b>Private Infra/Credit/Income Opps</b>		<b>9.00%</b>	<b>7.05%</b>	<b>6.40%</b>	<b>13.30%</b>	<b>5.25%</b>
Private Infrastructure	Cambridge Global Private Infra (lag)	5.40%	7.55%	6.60%	15.20%	5.25%
Private Credit	Bloomberg US High Yield (lag)	3.60%	6.50%	5.90%	12.10%	5.25%
<b>Absolute Return</b>		<b>6.00%</b>	<b>4.25%</b>	<b>4.00%</b>	<b>8.00%</b>	<b>0.00%</b>
Hedge Funds	HFRI Total HFOF Universe	6.00%	4.25%	4.00%	8.00%	0.00%
<b>Risk Parity</b>		<b>1.00%</b>	<b>5.70%</b>	<b>5.25%</b>	<b>10.90%</b>	<b>2.45%</b>
Risk Parity	HFR Risk Parity Vol 12	1.00%	5.70%	5.25%	10.90%	2.45%
<b>Cash Equivalents</b>		<b>2.00%</b>	<b>1.00%</b>	<b>1.00%</b>	<b>0.90%</b>	<b>1.00%</b>
Hedge Funds	90-Day T-Bill	2.00%	1.00%	1.00%	0.90%	1.00%
<b>Total Fund</b>	APFC Total Fund Target	<b>100.00%</b>	<b>6.90%</b>	<b>6.20%</b>	<b>13.50%</b>	<b>2.40%</b>
<b>Inflation</b>	CPI-U			2.00%	1.50%	

# APFC Total Fund Policy Target

## Projected Return and Standard Deviation

- Projected median 10-year annualized return of 6.20% is a reduction of roughly 55 basis points relative to last year.
- Inflation expectation reduced from 2.25% to 2.00%.
- Projected median 10-year annualized real return of 4.20% is a reduction of roughly 30 basis points relative to last year.
- Projected standard deviation of 13.50% is roughly the same as last year.
- Percent probability of exceeding 5% annualized real return over 10-year horizon is estimated to be 45.6%.

## APFC Total Fund Target



Expected 10-year Geometric Return: 6.20%  
Expected Standard Deviation: 13.50%  
Expected Inflation: 2.00%  
Expected Real Return: 4.20%

# Broad Capital Market Performance

For Periods Ended December 31, 2021

## Returns for periods ended December 31, 2021

