Callan

Alabama Trust Fund

2021 Asset Allocation and Spending Study

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Why Conduct an Asset Allocation and Spending Study?

- **Cornerstone of Strategic Planning:**
  - Acknowledge change and uncertainty in the capital markets
  - Project and evaluate impact of uncertainty on assets and spending levels
  - Establish reasonable return expectations
  - Determine the objectives of the Fund
  - Determine the Fund's risk tolerance
  - Provide the basis for selecting an asset allocation policy that appropriately reflects risk and return objectives
- **Last Study conducted in 2015**
  - Fund has absorbed impact of strong equity markets since 2015 and the impact of recession in 2020 spurred by global shutdown in response to the COVID pandemic
  - Substantially lower projections for gas royalty revenues compared to history going forward (lower production, lower prices)
  - Distribution policy for the ATF:
    - 5% of market value of Fund assets (smoothed over three years, lagged by two fiscal years), plus 33% of gross ATF royalty revenue, lagged by two fiscal years. Distributions are made quarterly.
    - 35% of oil and gas revenues paid into the ATF are redistributed to the County and Municipal Trust (CMT) and the Capital Improvement Trust (CIT), paid on October 1 from the prior fiscal year.
    - 5% distribution policy is high relative to many endowment organizations and may be difficult to achieve while maintaining the real purchasing power of the Fund going forward
    - Meeting 5% policy may require the ATF to pursue more return at the cost of greater risk
  - The ATF may need to consider a lower distribution rate – a common consideration among endowments and state natural resource based funds

2021 Capital Market Expectations
Return and Risk for 10 Years (2021-2030)

Asset Class	Index	PROJECTED RETURN 1-Year Arithmetic	10-Year Geometric*	Real	PROJECTED RISK Standard Deviation	Projected Yield
Equities						
Broad U.S. Equity	Russell 3000	8.00%	6.60%	4.60%	17.95%	1.95%
Large Cap U.S. Equity	S&P 500	7.85%	6.50%	4.50%	17.70%	2.00%
Small/Mid Cap U.S. Equity	Russell 2500	8.75%	6.70%	4.70%	21.30%	1.75%
Global ex-U.S. Equity	MSCI ACWI ex USA	8.70%	6.80%	4.80%	20.70%	2.80%
Developed ex-U.S. Equity	MSCI World ex USA	8.25%	6.50%	4.50%	19.90%	3.00%
Emerging Market Equity	MSCI Emerging Markets	9.80%	6.90%	4.90%	25.15%	2.35%
Fixed Income						
Short Duration Gov't/Credit	Bloomberg Barclays 1-3 Yr G/C	1.50%	1.50%	-0.50%	2.00%	1.55%
Core U.S. Fixed	Bloomberg Barclays Aggregate	1.80%	1.75%	-0.25%	3.75%	2.50%
Long Government	Bloomberg Barclays Long Gov	1.35%	0.60%	-1.40%	12.50%	3.00%
Long Credit	Bloomberg Barclays Long Cred	2.95%	2.45%	0.45%	10.50%	4.65%
Long Government/Credit	Bloomberg Barclays Long G/C	2.30%	1.80%	-0.20%	10.40%	4.00%
TIPS	Bloomberg Barclays TIPS	1.80%	1.70%	-0.30%	5.05%	2.35%
High Yield	Bloomberg Barclays High Yield	4.85%	4.35%	2.35%	10.75%	6.70%
Global ex-U.S. Fixed	Bloomberg Barclays Gl Agg xUSD	1.15%	0.75%	-1.25%	9.20%	1.80%
Emerging Market Sovereign Debt	EMBI Global Diversified	3.90%	3.50%	1.50%	9.50%	5.95%
Alternatives						
Core Real Estate	NCREIF ODCE	6.60%	5.75%	3.75%	14.10%	4.40%
Private Infrastructure	MSCI Glb Infra/FTSE Dev Core 50/50	7.00%	6.00%	4.00%	15.45%	4.60%
Private Equity	Cambridge Private Equity	11.50%	8.00%	6.00%	27.80%	0.00%
Private Credit	N/A	7.15%	6.25%	4.25%	14.60%	6.25%
Hedge Funds	Callan Hedge FoF Database	4.25%	4.00%	2.00%	8.00%	0.00%
Commodities	Bloomberg Commodity	3.80%	2.25%	0.25%	18.00%	2.00%
Cash Equivalents	90-Day T-Bill	1.00%	1.00%	-1.00%	0.90%	1.00%
Inflation	CPI-U		2.00%		1.50%	

Source: Callan

** Geometric returns are derived from arithmetic returns and the associated risk (standard deviation).*

- Our capital market projections define uncertainty
- We are not predicting a specific return, but the breadth of possible returns and the likelihood of their occurrence
- Risk, equal to standard deviation of return, means how wide the range of returns can be around the expected return
- Geometric returns are derived from arithmetic returns and the associated risk (standard deviation)

Efficient Asset Mix Alternatives

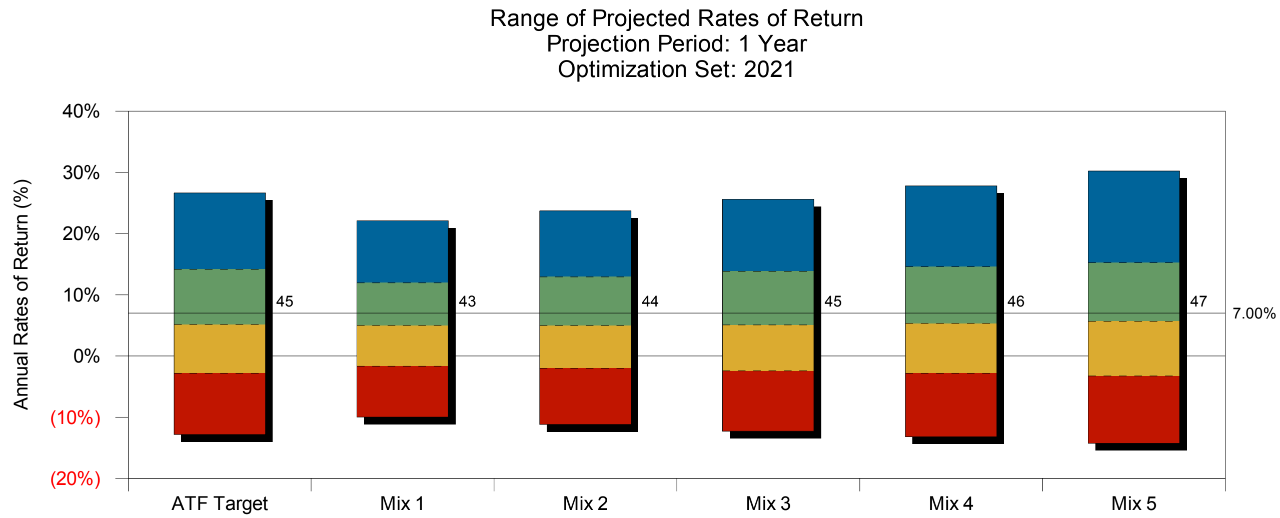
Existing ATF Asset Classes

Asset Class	Policy Target	Optimal Mixes Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
U.S. Large Cap Equity	25%	23%	25%	27%	29%	31%
U.S. Small Cap Equity	7%	4%	5%	5%	6%	6%
Non-U.S. Equity	24%	18%	19%	21%	23%	25%
U.S. Fixed Income	30%	40%	35%	30%	25%	20%
Real Estate	9%	9%	10%	11%	11%	12%
Hedge Funds	5%	6%	6%	6%	6%	6%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Expected Return	**5.48%**	**4.94%**	**5.18%**	**5.41%**	**5.64%**	**5.86%**
Expected Real Return	**3.48%**	**2.94%**	**3.18%**	**3.41%**	**3.64%**	**3.86%**
Expected Standard Deviation	**11.44%**	**9.44%**	**10.27%**	**11.11%**	**11.96%**	**12.81%**
Total Return-Seeking (%)	**65%**	**54%**	**59%**	**64%**	**69%**	**74%**
Total Fixed Income (%)	**30%**	**40%**	**35%**	**30%**	**25%**	**20%**
% Illiquid	**9%**	**9%**	**10%**	**11%**	**11%**	**12%**

- Reflects existing asset classes, including broad international equity and real estate; Real estate is classified as the only "illiquid" asset class, although hedge funds are less liquid over the short term than public market stocks and bonds
- No constraints imposed on the allocation to any asset class
- Expected return represents 10-year compound rate of 5.48%, between that of Mix 3 and Mix 4. Low return expectations for the capital markets mean even portfolios with 75% or 80% exposure to return-seeking assets (Mix 4 and Mix 5) will be challenged to reach 7%.
- Current spending policy = 5% of MV Assets, smoothed over three years and lagged two fiscal years, plus 33% of gross ATF royalty payments, lagged one year; results in an effective spending policy of ~ 4.5%. Sustainable spending policies are typically set at or just below the long-term real return expectation.
- Policy target real return expectation is 3.48%, compared to the 5% spending policy and the effective rate of 4.5%
- ATF asset allocation with 30% in fixed income is somewhat conservative compared to other state natural resource funds and Callan's Endowment and Foundation peer group; spending policy is on the higher end of the range.

Asset Mix Alternatives

Range of Projected Returns – One Year



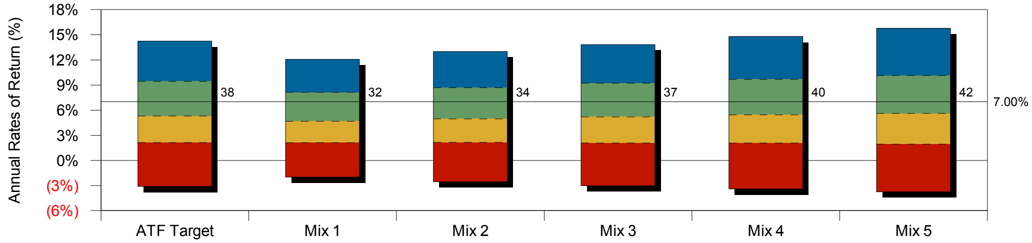
	ATF Target	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
5th Percentile	26.6%	22.1%	23.7%	25.6%	27.8%	30.2%
25th Percentile	14.2%	12.0%	12.9%	13.8%	14.6%	15.3%
Median	5.2%	5.0%	5.0%	5.1%	5.3%	5.6%
75th Percentile	(2.8%)	(1.7%)	(2.0%)	(2.4%)	(2.8%)	(3.2%)
95th Percentile	(12.8%)	(10.0%)	(11.2%)	(12.3%)	(13.2%)	(14.3%)
Prob > 7.00%	45.1%	42.9%	43.5%	44.7%	45.8%	46.6%

- We use simulation to derive a range of expected returns and the likelihood of their occurrence
- Increased volatility with greater equity exposure
- 7.0% hurdle is implied by 5% spending rate plus 2.0% inflation assumption (from Callan); probability of achieving at least a 7.0% return rises with greater risk and wider range of results

Asset Mix Alternatives

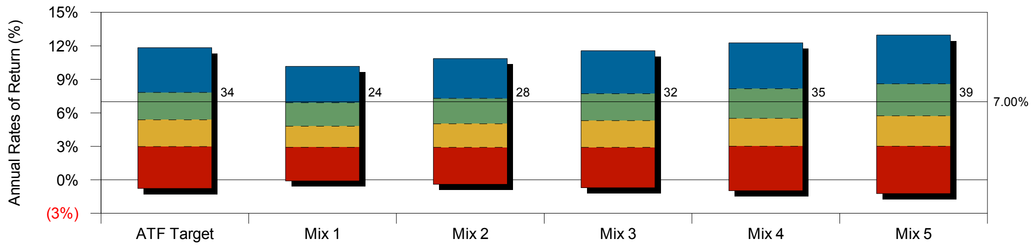
Range of Projected Returns – Five and Ten Years

Range of Projected Rates of Return
Projection Period: 5 Years



	ATF Target	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
5th Percentile	14.2%	12.1%	13.0%	13.8%	14.8%	15.8%
25th Percentile	9.4%	8.1%	8.7%	9.2%	9.7%	10.1%
Median	5.3%	4.7%	5.0%	5.2%	5.4%	5.6%
75th Percentile	2.1%	2.1%	2.2%	2.1%	2.1%	1.9%
95th Percentile	(3.1%)	(2.0%)	(2.5%)	(3.0%)	(3.4%)	(3.8%)
Prob > 7.00%	38.0%	31.8%	34.4%	37.2%	39.8%	42.4%

Range of Projected Rates of Return
Projection Period: 10 Years



	ATF Target	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
5th Percentile	11.8%	10.2%	10.9%	11.6%	12.3%	13.0%
25th Percentile	7.8%	6.9%	7.3%	7.7%	8.2%	8.6%
Median	5.4%	4.8%	5.0%	5.3%	5.5%	5.7%
75th Percentile	3.0%	2.9%	2.9%	2.9%	3.0%	3.0%
95th Percentile	(0.8%)	(0.1%)	(0.4%)	(0.7%)	(1.0%)	(1.2%)
Prob > 7.00%	33.6%	23.8%	27.8%	31.6%	35.4%	38.8%

- Range of returns narrows over longer time period. This is the benefit of “time diversification”, where extreme events offset one another producing less volatility
- Negative returns are less likely over longer time period (roughly 1 in 20 chance)
- 7.0% hurdle is implied by 5% spending rate plus 2.0% inflation assumption (from Callan); probability of achieving at least a 7.0% return rises with greater risk and wider range of results

Spending Policy

Considerations

- General rule of thumb: to balance intergenerational equity, a policy can't spend more than the expected real return on investments over the long run.
- Rule leads many endowments, foundations and trusts to seek a higher return to support higher real spending.
  - Inflation of 2%-3% plus a nominal return target of 7% results in a real return expectation of 4%-5%
  - 4%-5% is very typical of the spending targeted by a majority of endowments & foundations
  - Challenge in today's environment: generating a real return of 5%, or even 4%. Many institutions are reconsidering spending policies in light of expectations for the capital markets.
- Current spending policy = 5% of the three-year average market value of invested assets. The calculation is lagged two fiscal years; FY 2021 distributions were are based on the three-year average market value from 2017-2019.
  - Spend policy also includes 33% of gross ATF royalty payments. Production is much lower and declining compared to past volumes; spending tied to royalties becomes de minimus over the 10 and 20 year forecast horizon
- Spending is linked to the total return of the Fund, rather than restricted to income. A more aggressive asset allocation (more equity exposure) generates greater expected market value, leading to higher expected spending levels
- Greater equity exposure generates greater volatility in the investment results; averaging market value over 3 years smooths the spending results

Summary of Simulation Results

5% Market Value Spending

- Royalty revenue is not expected to support spending in excess of the real investment return over the next 20 years. The Current Target, bracketed by Mixes 3 and 4 is not expected to generate real returns close to the effective spending rate. Mixes with substantially greater exposure to growth (equities) offer the greatest chance to sustain the purchasing power of the Fund, given 5% spending and current capital market expectations.
- A more aggressive asset allocation increases the likelihood that the real value of the Fund can be maintained, at the cost of greater volatility, which translates into greater downside risk
- Risk/reward trade-off at 20 years appears to point to a mix at least as risky as Mix 4, and out to Mix 5, which are similar in risk posture to many endowments and other state natural resource funds. However, Mix 4 (25% fixed income) and Mix 5 (20% fixed income) represent substantially riskier portfolios with more volatile potential results than the current target mix, and a different risk posture than the ATF Board has articulated in the past.
- The Fund could consider a move to take on somewhat greater risk (more equity). This move can help provide the Fund with more return in a risk-controlled manner. The recommendations mirror those adopted within the CMT, and could be implemented with the current managers in the ATF portfolio.
- The Fund could consider lowering the 5% spending policy in order to protect the corpus.

Consider Higher Allocation to Equity, Real Estate

Asset Class	Policy Target	Optimal Mixes Mix 1	Mix 2	Mix 3	Mix 4	Mix 4A	Mix 5
U.S. Large Cap Equity	25%	23%	25%	27%	29%	28%	31%
U.S. Small Cap Equity	7%	4%	5%	5%	6%	7%	6%
Non-U.S. Equity	24%	18%	19%	21%	23%	25%	25%
U.S. Fixed Income	30%	40%	35%	30%	25%	25%	20%
Real Estate	9%	9%	10%	11%	11%	10%	12%
Hedge Funds	5%	6%	6%	6%	6%	5%	6%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Expected Return	**5.48%**	**4.94%**	**5.18%**	**5.41%**	**5.64%**	**5.70%**	**5.86%**
Expected Real Return	**3.48%**	**2.94%**	**3.18%**	**3.41%**	**3.64%**	**3.70%**	**3.86%**
Expected Standard Deviation	**11.44%**	**9.44%**	**10.27%**	**11.11%**	**11.96%**	**12.24%**	**12.81%**
Total Return-Seeking (%)	**65%**	**54%**	**59%**	**64%**	**69%**	**70%**	**74%**
Total Fixed Income (%)	**30%**	**40%**	**35%**	**30%**	**25%**	**25%**	**20%**
% Illiquid	**9%**	**9%**	**10%**	**11%**	**11%**	**10%**	**12%**

- Mix 4A increases exposure to growth assets, shifts 5% from fixed income to equity and real estate, reduces fixed income from 30% to 25%
  - Increases both return and risk relative to the current policy target
  - 3% increase to US large cap equity
  - 1% increase to non-US equity
  - 1% increase to real estate

Existing and Proposed New Policy Targets

Asset Class	Policy Target	Mix 4A
U.S. Large Cap Equity	25%	28%
U.S. Small Cap Equity	7%	7%
Non-U.S. Equity	24%	25%
U.S. Fixed Income	30%	25%
Real Estate	9%	10%
Hedge Funds	5%	5%
Total	**100%**	**100%**
Expected Return	**5.48%**	**5.70%**
Expected Real Return	**3.48%**	**3.70%**
Expected Standard Deviation	**11.44%**	**12.24%**
Total Return-Seeking (%)	**65%**	**70%**
Total Fixed Income (%)	**30%**	**25%**
% Illiquid	**9%**	**10%**

- Expected return for Mix 4A shows a modest increase in return and risk, with 5% less in fixed income
- Mix 4A aligns with the new policy target adopted by the CMT, with 25% in fixed income
- We continue to support the inclusion of long-biased MAC strategies (5%) within the large cap US equity allocation, already employed within the ATF, to provide diversification in the large allocation to equity and potential for a differentiated source of alpha
- Current spending policy = 5% of MV Assets, smoothed over three years and lagged two fiscal years; results in an effective spending policy of ~ 4.5%. Sustainable spending policies are typically set at or just below the long-term real return expectation.
- Proposed potential policy targets increase real return expectation over the current target in exchange for an increase in risk, but the current capital market assumptions suggest that reaching 4.5% real will be a challenge over the next 10 years
- Existing ATF asset allocation with 30% in fixed income is somewhat conservative compared to Endowment and Foundation peer group; spending policy is on the higher end of the typical range. New target reduces the fixed income exposure to 25% from 30%, increasing exposure to public equity and to real estate.

Summary

Conclusions and Recommendations

- The appropriate asset allocation will attempt to balance the dual objectives of maintaining or increasing real spending while maintaining or growing the real (inflation-protected) value of the Trust over the projection period.
- In the absence of gas royalty inflows:
  - A 5% of MV spending level may be difficult to sustain in the long run – spending policy is effectively greater than the real investment return for even the most aggressive asset mixes.
- Under the current projection of gas royalty inflows:
  - Royalties are insufficient to offset the spending generated by the 5% of MV spending level even for the more aggressive asset mixes; the ATF will need to retain substantial exposure to growth assets to help offset a decline in the real value of the corpus.
  - Pursuit of return to meet the current spending policy will result in more variability of spending from year to year.
- **Increase/Maintain Real Market Value Objective**
  - Current spending policy – A mix that lies between Mix 4 and Mix 5 on the efficient frontier, generating a reasonable probability of purchasing power protection, balanced against the worsening of the worse case. We believe a minimum exposure of 10% to fixed income is vital to help offset equity risk.
- **Increase/Maintain Real Spending Objective**
  - Current spending policy – with spending tied to the Fund asset values, more aggressive mixes look very attractive in the expected case. The smoothing of assets over three years dampens the impact of any one particular year; mixes more aggressive than Mix 3, such as Mix 4 and Mix 5 have a better chance to maintain/increase real spending. The current target lies between Mix 3 and Mix 4, and does not meet this requirement.
- **In order for the ATF to Maintain Real Market Value and Real Spending Objectives, we recommend:**
  - Adopt a more aggressive asset allocation policy – reducing fixed income exposure by 5%
  - Consider moving to Mix 4A which will have a greater probability of generating purchasing power protection while balancing against the worsening of the worse case.
  - Consider reducing the current spending policy by 50 basis points from 5% to 4.5% to increase the probability of maintaining the corpus.

Considerations to Lower Spending Rate Than 5%

Spending policy best practice aims to align spending rate with expected real return on the investments

- Preserve purchasing power of the corpus
- Meet the goal of intergenerational equity

Endowments and community foundations show effective spending policies that are closer to 4.5%; accounting for expenses and the effect of smoothing of assets, formal distribution policies are clustered between 4% and 4.5%

With gas royalties becoming a minimal inflow going forward, the ATF has to operate like an endowment in aligning spending policy with expected investment return after inflation

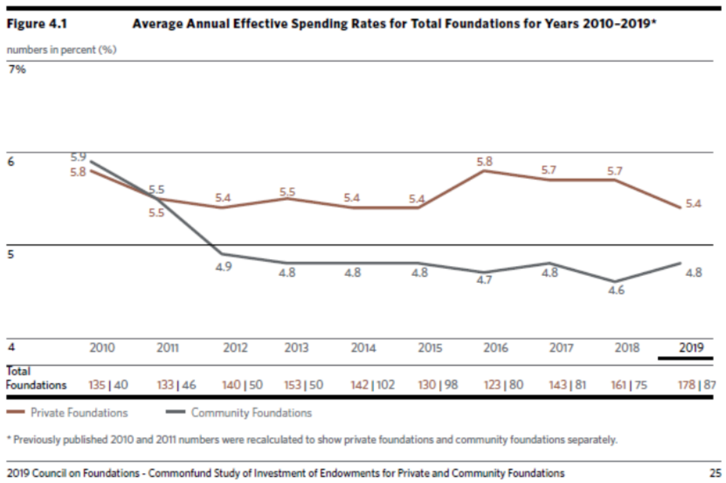
Callan works with a number of state-sponsored natural resource funds. Implementation of spending policies vary widely, and often reference specified legislative spending amounts, but *effective* spending rates are well below 5%

- Alaska Permanent Fund
- Colorado Land Board
- Endowment Fund Investment Board of Idaho

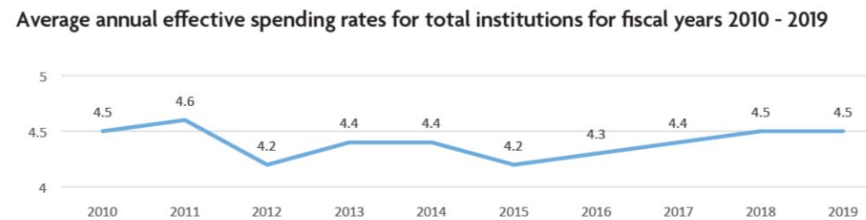
Effective Spending Rates Are Below 5% For Endowments and Foundations

Rates Trended Down at the Start of the Last Decade; 5% is No Longer the Norm

Council on Foundations – Commonfund Spending Rates



2019 NACUBO-TIAA Spending Rates



Dominant spending policy type is % of Market Value, typically averaged over several years.

Spending policies typically include expenses; stated distribution policy norm is closer to 4.5% (or lower); effective spending rate is $ distributed for spending + expenses/value of the corpus

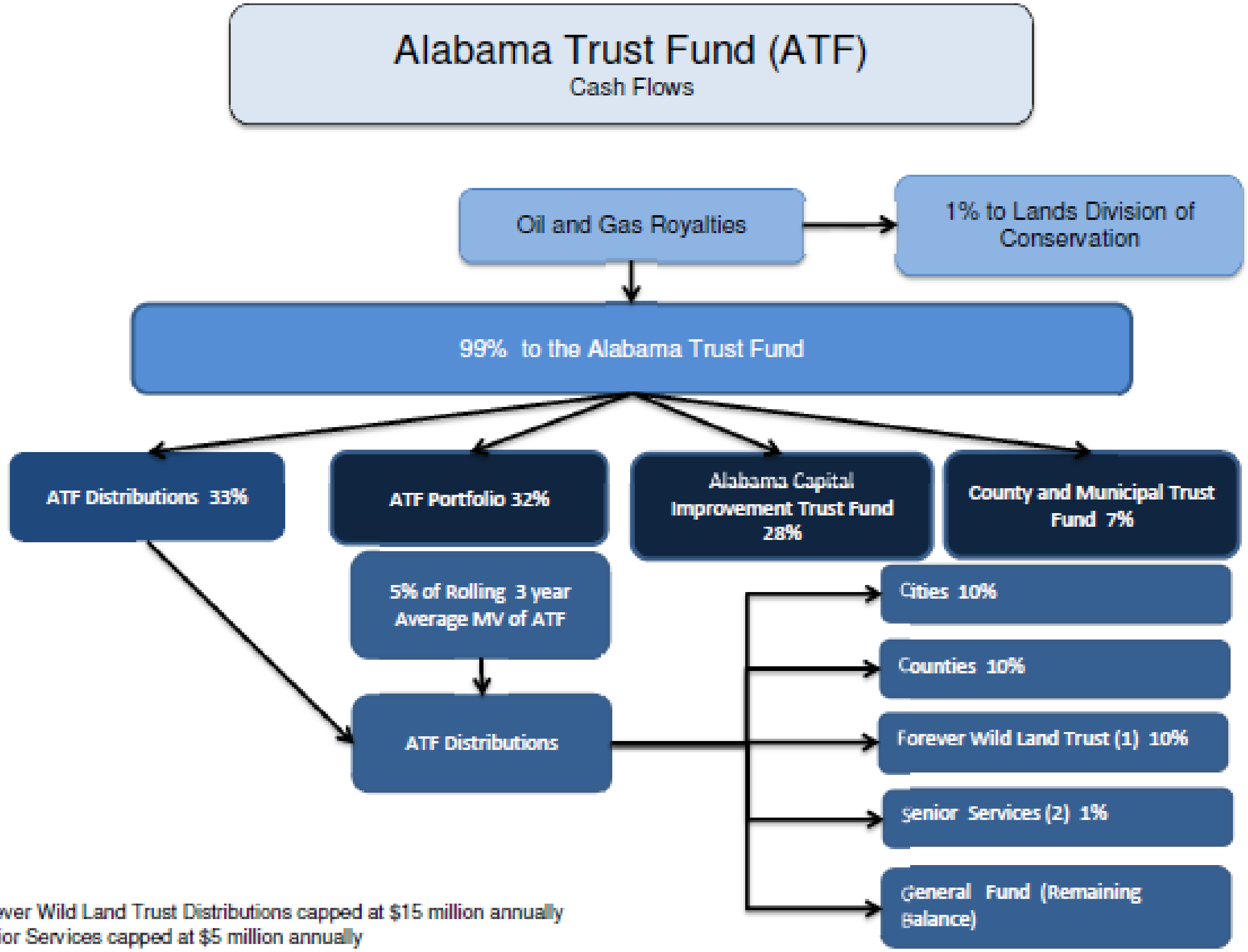
5% spending (plus 1/3 of royalties and expenses) for ATF is on the high side of the endowment peer group

Note that private foundations are required to spend 5% by IRS rules, and less comparable than community foundations and university endowments

Source: left graph – 2019 Council on Foundations - Commonfund Study of Investment of Endowments for Private and Community Foundations; right graph – 2019 NACUBO-TIAA Study of Endowments

ATF Fund Spending Policy
Deterministic Projections
Monte Carlo Simulations

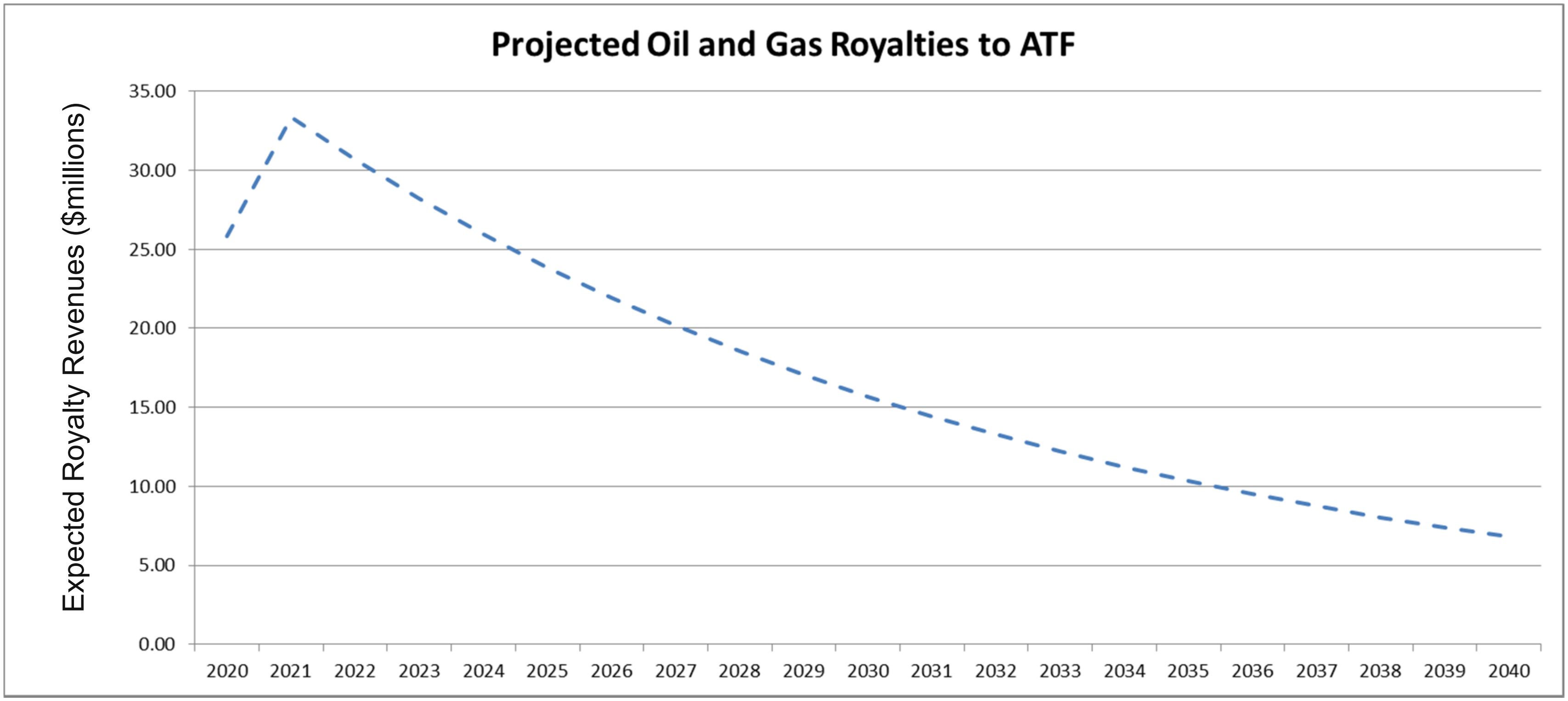
Alabama Trust Fund – Cash Flows



1) Forever Wild Land Trust Distributions capped at $15 million annually
2) Senior Services capped at $5 million annually

Source: Alabama Trust Fund

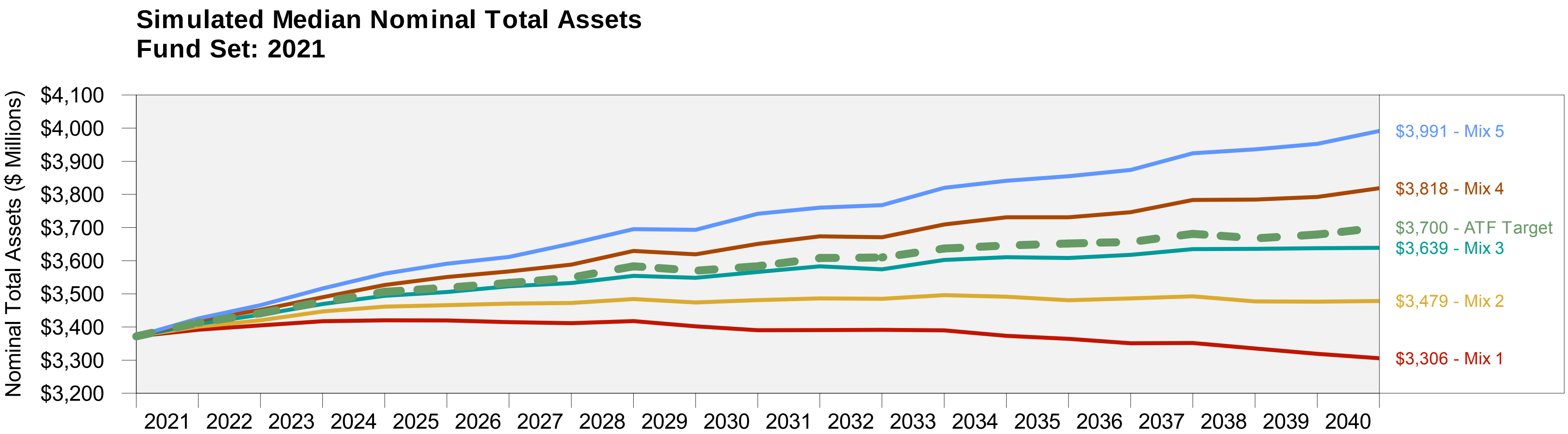
2021 Projected ATF Royalty Revenue



- ATF receives 99% of expected oil and gas royalty revenues each fiscal year. paid in October of the following fiscal year
- Projection assumes Natural Gas price held constant at $2.80 per MCF over the forecast interval. Gas prices are substantially below recent years and plunged in the first half of 2020; $2.80 is an approximation of current pricing as of November 2020 and consistent with the projections used in the CMT asset/spending study presented) after the drop in Q2 and recovery in Q3
- Production estimates and price forecasts developed in a model provided by State Oil & Gas Board

Projected Growth in Market Value, Nominal Dollars

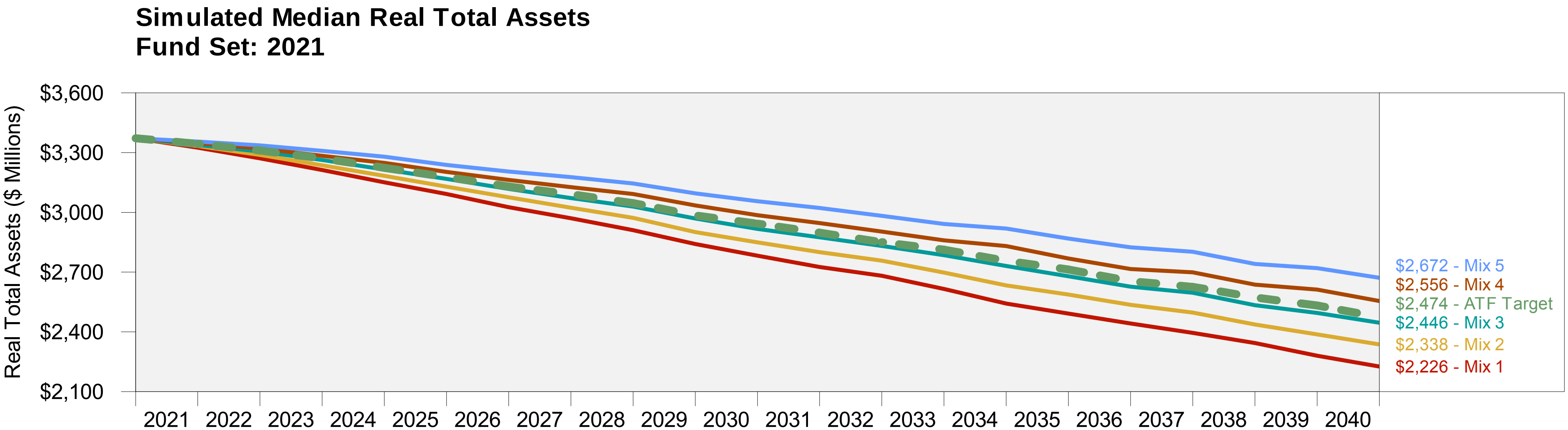
Current Policy - 5% Market Value Spending



- Nominal market value increases under all asset allocation alternatives, including the target
- A more aggressive asset allocation has a higher expected nominal market value

Projected Growth in Real Market Value (Inflation-Adjusted)

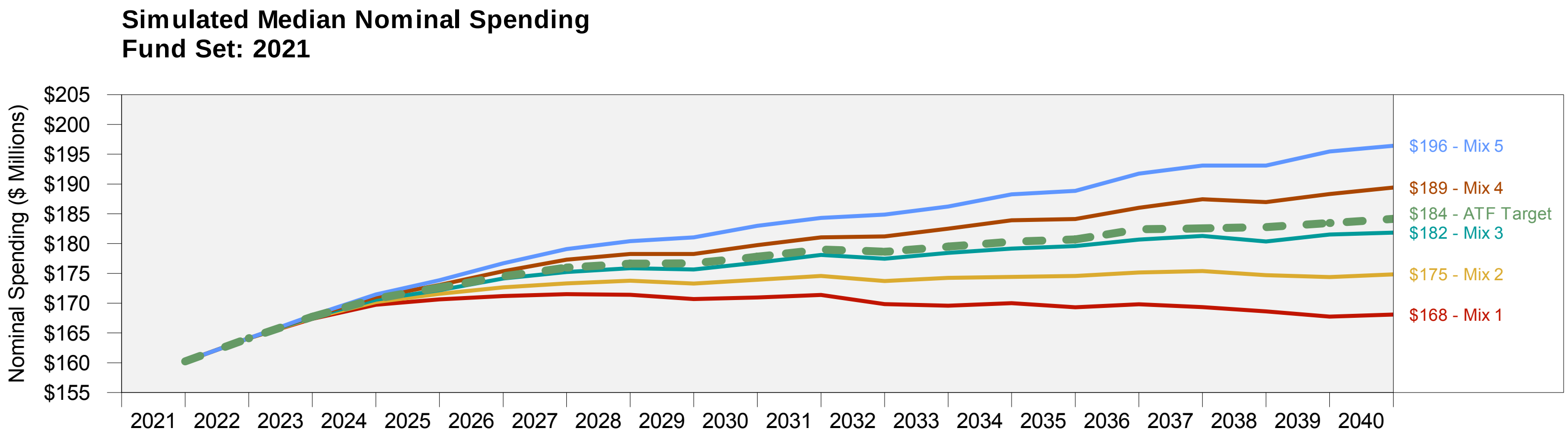
Current Policy - 5% Market Value Spending

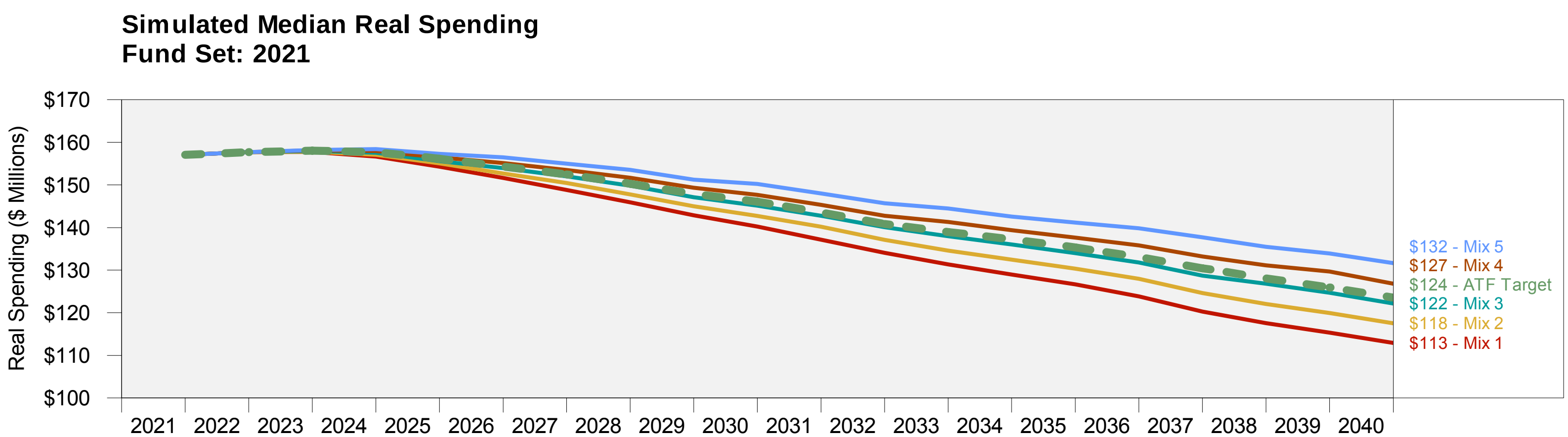


- Purchasing power of a fund with a distribution policy like the ATF can be sustained over the long run only if the return net of inflation can keep up with spending rate
- The ATF will be challenged to sustain the purchasing power over the long run without higher exposure to riskier growth assets (such as equities). Mix 5 has just 20% in fixed income but is not projected to maintain the purchasing power net of distributions in the median or expected case
- The future inflows of gas royalties are not sufficient to offset spending rates that are in excess of the asset mix real returns for the current target and alternative Mixes

Projected Growth in Spending, Both Nominal and Real

Current Policy - 5% Market Value Spending

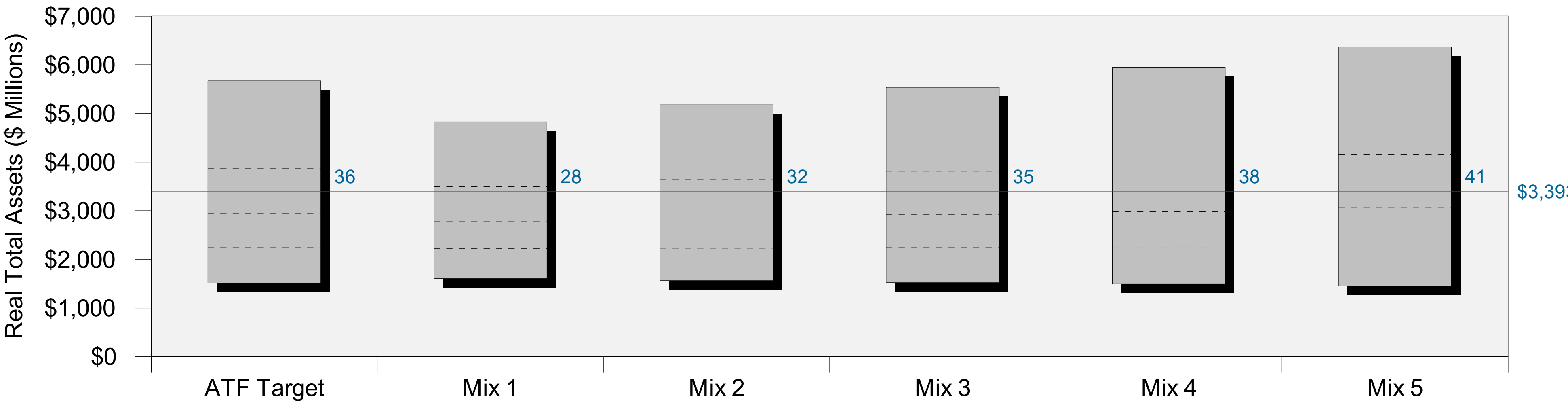




- Nominal spending increases under all asset allocations, although spending flattens over time for most mixes
- Real (inflation-adjusted) spending is expected to decline even under the highest equity allocations (Mixes 4 and 5). Declining gas royalties and spending in excess of the real return gradually erode the real value of the corpus. The decline is tempered with greater equity exposure.
- A decline in real spending over time can cause intergenerational inequity

Projected Real Market Value

In 2030

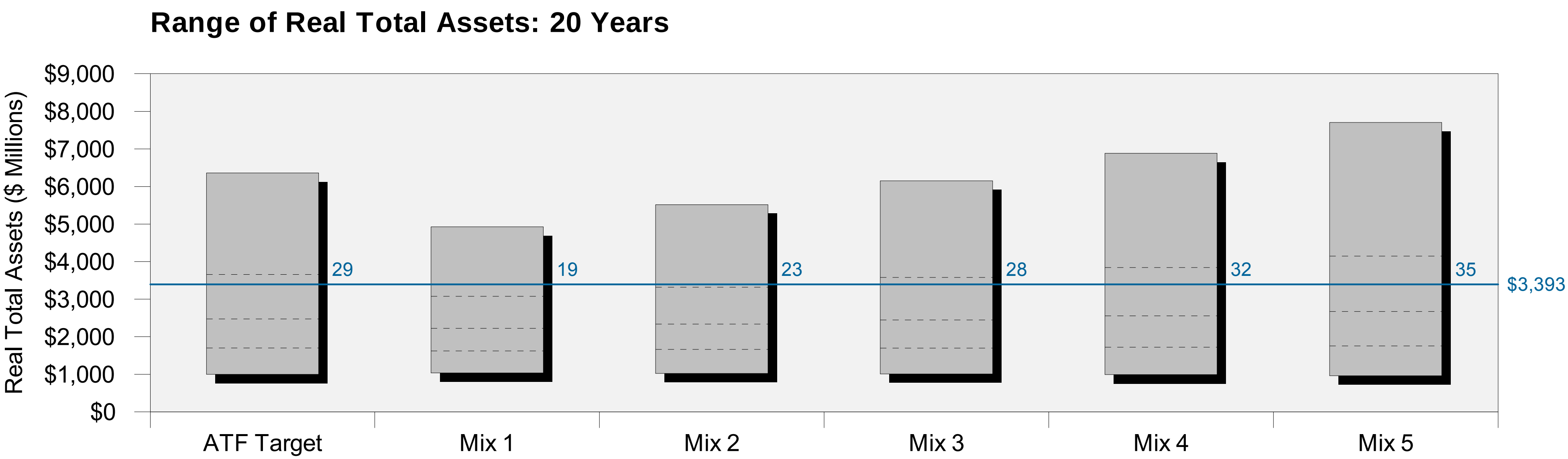


	ATF Target	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
5th Percentile	$5,669	$4,823	$5,176	$5,535	$5,949	$6,367
25th Percentile	$3,863	$3,494	$3,650	$3,809	$3,983	$4,150
Median	$2,943	$2,783	$2,849	$2,918	$2,985	$3,056
75th Percentile	$2,235	$2,219	$2,227	$2,236	$2,245	$2,253
95th Percentile	$1,508	$1,604	$1,562	$1,527	$1,489	$1,457
Prob > $3,393	36.3%	27.9%	31.6%	35.3%	38.2%	40.5%

- Erosion of purchasing power occurs if projected real market value falls below today's market value ($3,393 mm at the start of the current fiscal year, September 30, 2020) as represented by the blue line. Purchasing power under current spending policy over ten years can be maintained, but only under substantial equity exposure; the more aggressive mixes (but not the Current Target) close the gap.

Projected Real Market Value

In 2040

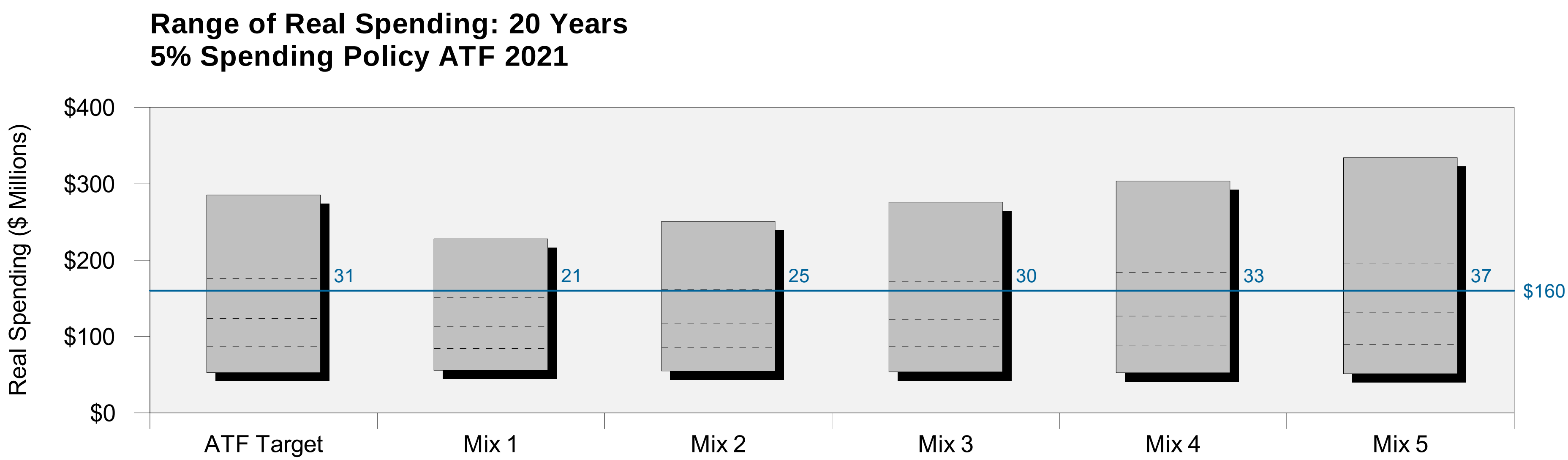


	ATF Target	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
5th Percentile	$6,360	$4,926	$5,518	$6,153	$6,883	$7,704
25th Percentile	$3,657	$3,076	$3,317	$3,577	$3,846	$4,147
Median	$2,474	$2,226	$2,338	$2,446	$2,556	$2,672
75th Percentile	$1,704	$1,624	$1,666	$1,699	$1,724	$1,753
95th Percentile	$1,000	$1,041	$1,028	$1,012	$992	$965
Prob > $3,393	29.3%	18.7%	23.4%	27.9%	31.8%	35.2%

- Erosion of purchasing power occurs if projected real market value falls below today's market value ($3393 mm at the start of the current fiscal year, September 30, 2020) as represented by the blue line. Purchasing power under current spending policy over twenty years can be maintained, but only under substantial equity exposure; the more aggressive mixes (but not the Current Target) close the gap.

Real Spending

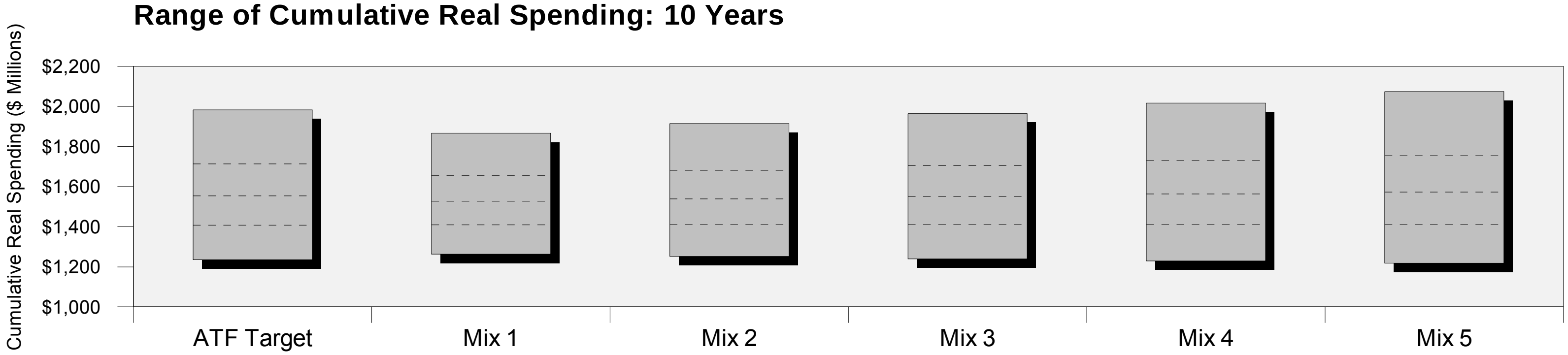
In 2040



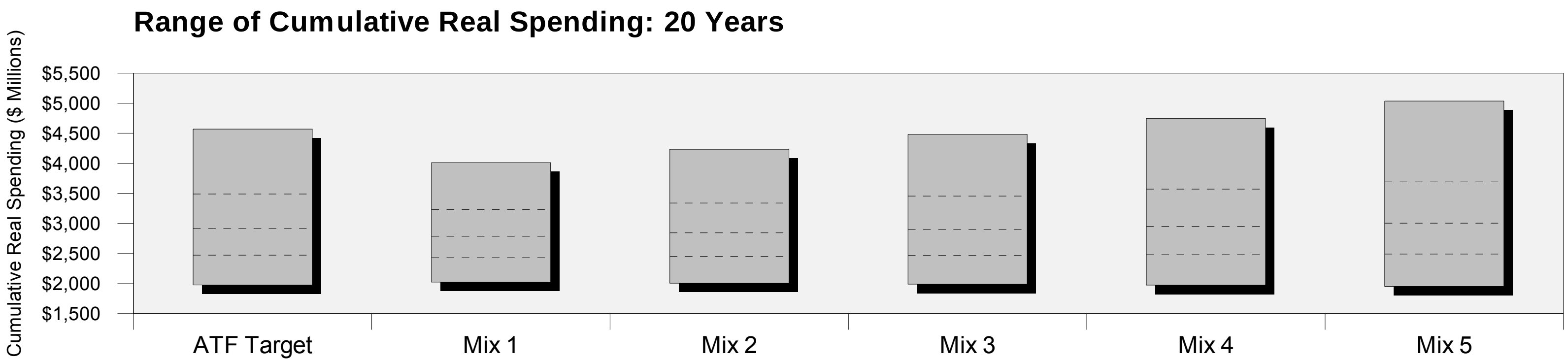
	ATF Target	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
5th Percentile	$285	$228	$251	$276	$304	$334
25th Percentile	$176	$151	$162	$172	$184	$196
Median	$124	$113	$118	$122	$127	$132
75th Percentile	$87	$84	$86	$87	$89	$89
95th Percentile	$53	$56	$55	$54	$52	$51
Prob > $160	30.8%	20.9%	25.5%	29.5%	33.0%	36.7%

- Intergenerational equity is often measured by the ability to maintain real spending over time
- ATF is expected to distribute $160 million in Fiscal 2021 from the 5% spending policy (not including the royalty spending); only the more aggressive mixes have reasonable probability of maintaining this level of spending in real dollars over the 20 year forecast horizon

Real Cumulative Spending Over 10 and 20 Years



	ATF Target	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
5th Percentile	$1,983	$1,867	$1,915	$1,964	$2,017	$2,074
25th Percentile	$1,713	$1,657	$1,681	$1,705	$1,730	$1,754
Median	$1,554	$1,528	$1,539	$1,551	$1,563	$1,573
75th Percentile	$1,408	$1,409	$1,410	$1,410	$1,410	$1,410
95th Percentile	$1,236	$1,263	$1,252	$1,240	$1,229	$1,219

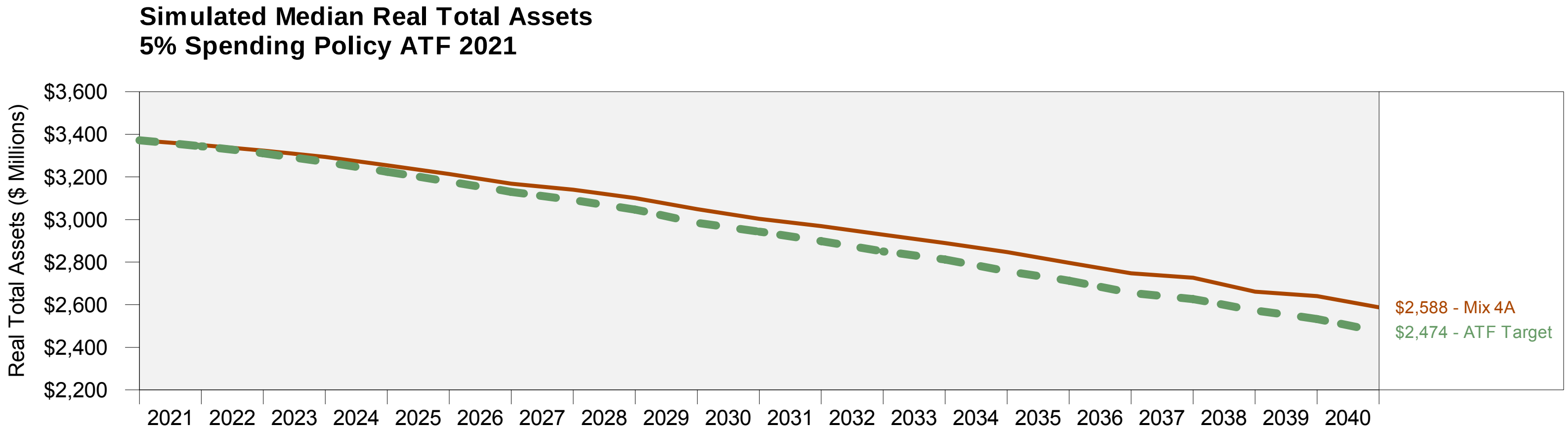


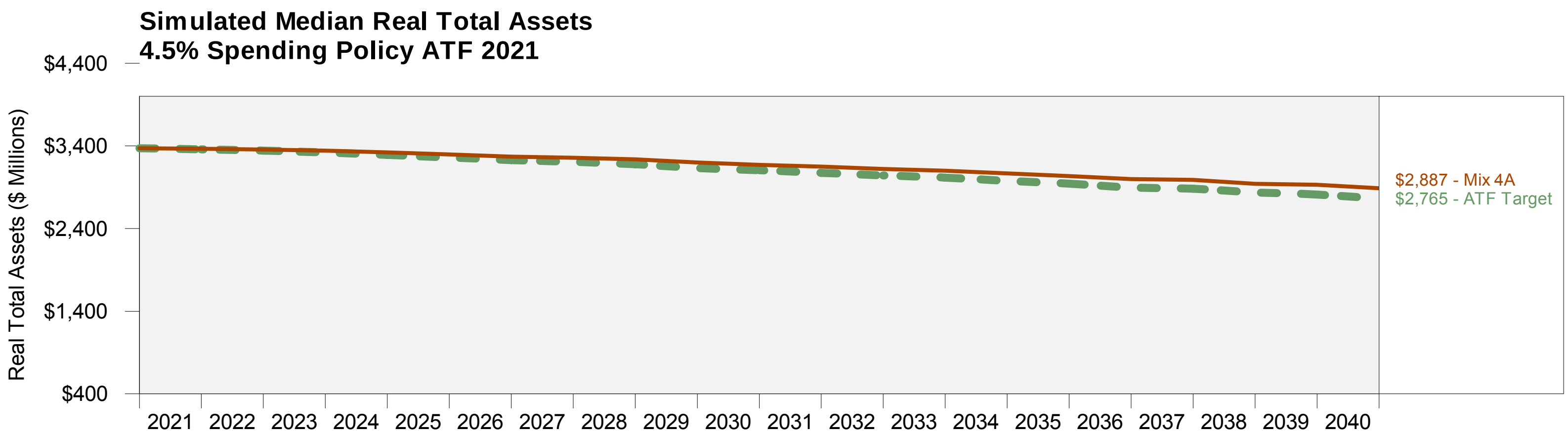
	ATF Target	Mix 1	Mix 2	Mix 3	Mix 4	Mix 5
5th Percentile	$4,570	$4,012	$4,235	$4,484	$4,745	$5,036
25th Percentile	$3,490	$3,235	$3,342	$3,458	$3,571	$3,692
Median	$2,917	$2,790	$2,847	$2,901	$2,954	$3,005
75th Percentile	$2,473	$2,433	$2,453	$2,470	$2,479	$2,492
95th Percentile	$1,979	$2,026	$2,010	$1,990	$1,975	$1,955

- Asset mixes with greater exposure to equity generate higher spending in the expected case, and particularly in the more optimistic capital market scenarios, but show a substantially wider range of potential outcomes, including less cumulative spending in the worse case

Projected Growth in Real Market Value

5% vs 4.5% Spending Rate

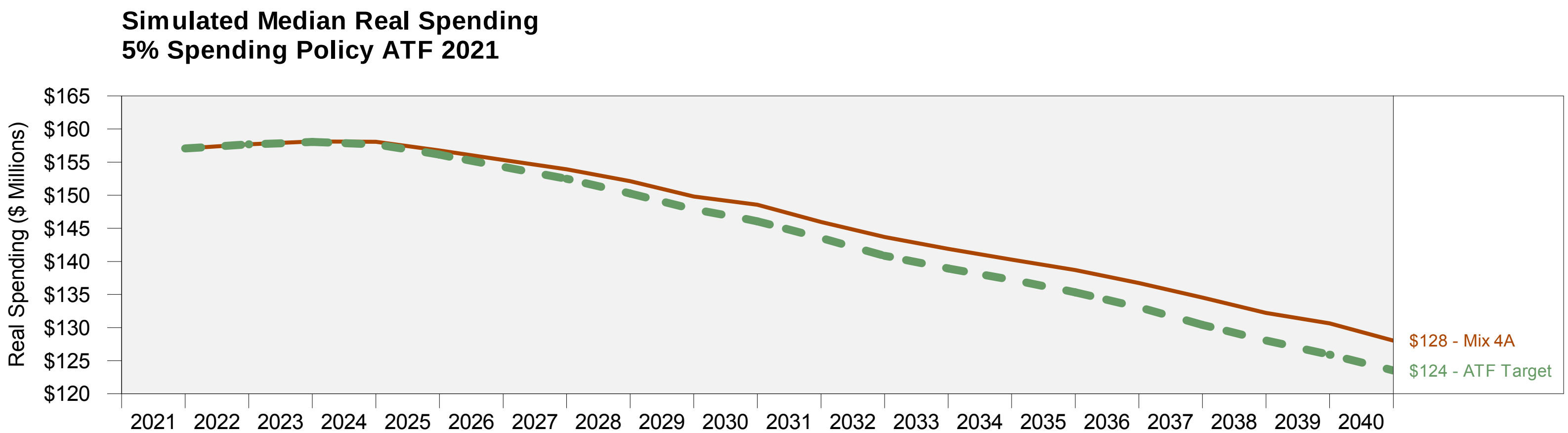


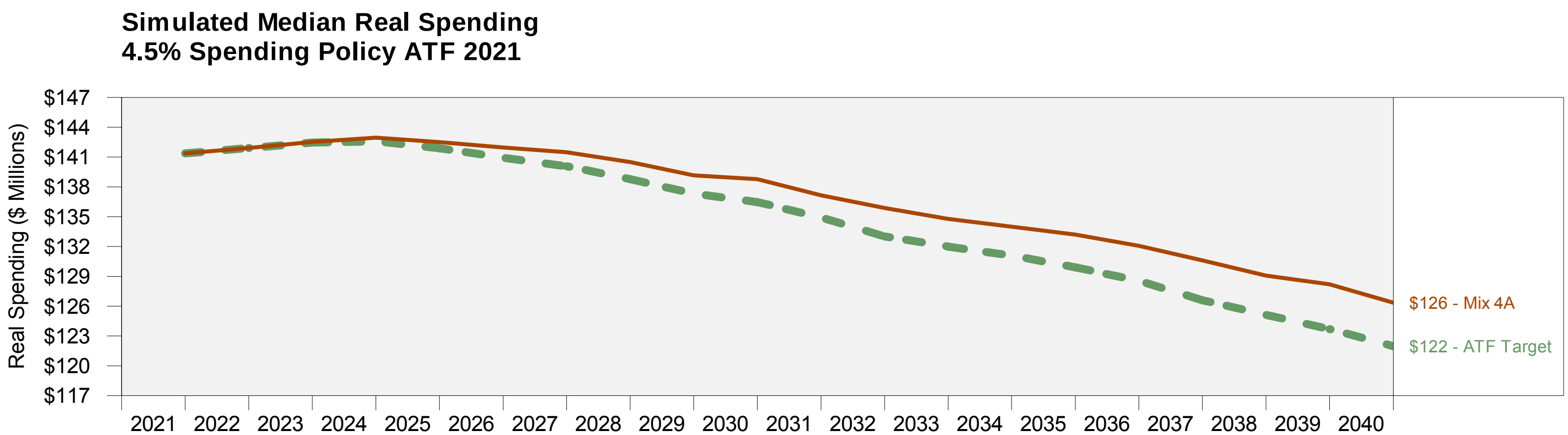


- Real (inflation-adjusted) market value of assets declines much less in the median case under a 4.5% spending policy. Mix 4A, with an additional 5% allocated to equity comes closer to maintaining the real value of the corpus over time than the current ATF portfolio.
- Preserving the real value of assets supports the goal of intergenerational inequity

Projected Growth in Real Spending

5% vs 4.5% Spending Rate





- Real (inflation-adjusted) spending is lower under a 4.5% spending policy, but declines less rapidly than under 5% spending. Mix 4A, with an additional 5% allocated to equity comes closer to maintaining the real spending over time than the current ATF portfolio.
- Preserving the real value of spending supports the goal of intergenerational inequity

Conclusions – Projections and Simulations

- The current spending policy (5% of Market Value) presents a challenge to preserving the purchasing power of the ATF. More aggressive asset mixes with greater equity exposure and expected real return closer to the effective spending rate are projected to come close to this preservation of purchasing power goal in a deterministic forecast. The current target mix is expected to generate less return than is sufficient to support the purchasing power of the Fund.
- Revised projections of gas production and prices suggest gas royalties will not be sufficient to offset spending in excess of the investment real return. In addition, low return expectations from the capital markets suggest a lower real return for all of the alternative mixes relative to long-term historical averages.
- The impact of gas royalties on the purchasing power and real spending can be profound. With royalty inflows ebbing, the purchasing power (real market value) and real spending will be more challenged over the forecast horizon, even for the most aggressive asset mixes such as Mix 5, with just 20% in fixed income.

APPENDIX

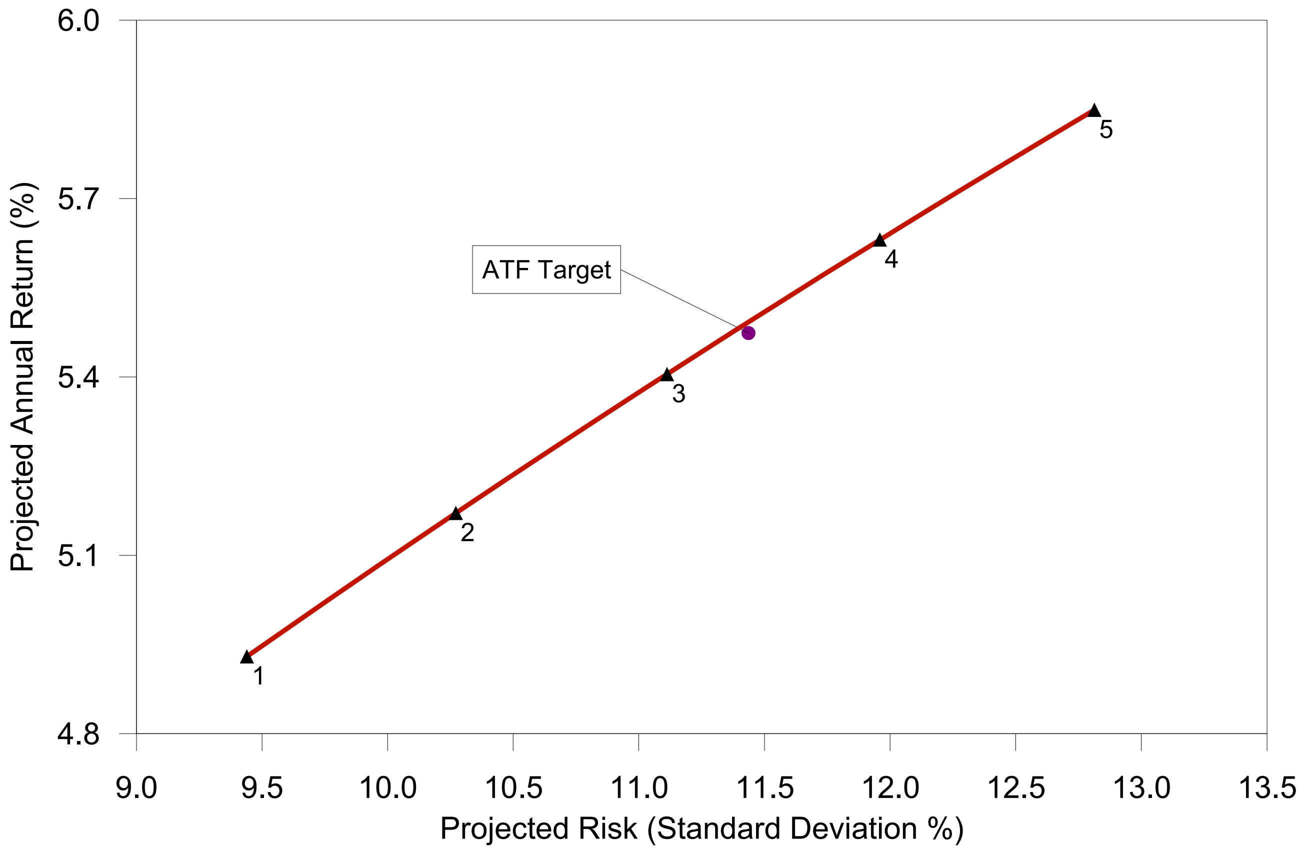
Monte Carlo Simulation

Understand the Full Range of Potential Capital Market Outcomes

- One simulation is equivalent to one possible future economic scenario.
- Simulate 5000 capital market outcomes for each asset mix.
- Simulate 5000 inflation outcomes (consistent with capital market outcomes) for each asset mix.
- Quantify the impact on important variables (nominal and real) in median-case (50th percentile) and worse-case (95th percentile) outcomes.

Efficient Asset Mix Alternatives

Efficient Frontier Depicting Risk and Return



2021–2030 Capital Markets Assumption Correlations

	Broad U.S. Equity	Large Cap	Smid Cap	Gl ex-U.S. Equity	Dev ex-U.S. Equity	Em Market Equity	Short Dur	Core U.S. Fixed	Long Gov	Long Credit	Long Gov / Credit	TIPS	High Yield	Global ex-U.S. Fixed	Em Market Debt	Core Real Estate	Private Infra	Private Equity	Private Credit	Hedge Funds	Comm	Cash Equiv	Inflation
Broad U.S. Eq	**1.00**																						
Large Cap	1.00	**1.00**																					
Smid Cap	0.93	0.90	**1.00**																				
Gl ex-U.S. Equity	0.82	0.81	0.80	**1.00**																			
Dev. ex-U.S. Eq	0.78	0.77	0.77	0.98	**1.00**																		
Em Market Eq	0.80	0.79	0.76	0.93	0.84	**1.00**																	
Short Duration	-0.06	-0.06	-0.08	-0.08	-0.06	-0.10	**1.00**																
Core U.S. Fixed	-0.10	-0.10	-0.12	-0.12	-0.11	-0.14	0.81	**1.00**															
Long Gov	-0.15	-0.15	-0.16	-0.15	-0.13	-0.16	0.67	0.84	**1.00**														
Long Credit	0.27	0.28	0.25	0.26	0.26	0.24	0.64	0.80	0.69	**1.00**													
Long Gov / Cr	0.09	0.09	0.07	0.09	0.09	0.07	0.71	0.88	0.90	0.94	**1.00**												
TIPS	-0.08	-0.08	-0.08	-0.09	-0.09	-0.10	0.56	0.65	0.53	0.52	0.57	**1.00**											
High Yield	0.72	0.71	0.68	0.71	0.69	0.69	-0.01	0.00	-0.08	0.40	0.20	0.06	**1.00**										
Gl ex-U.S. Fixed	0.01	0.01	0.00	0.06	0.05	0.08	0.48	0.50	0.42	0.49	0.50	0.40	0.12	**1.00**									
Em Market Debt	0.53	0.53	0.51	0.56	0.52	0.58	0.08	0.12	0.05	0.35	0.24	0.18	0.60	0.15	**1.00**								
Core Real Estate	0.71	0.71	0.66	0.67	0.66	0.63	-0.01	-0.04	-0.09	0.24	0.10	-0.02	0.53	-0.02	0.36	**1.00**							
Private Infra	0.72	0.72	0.67	0.69	0.68	0.65	0.00	0.01	-0.03	0.27	0.15	-0.02	0.50	0.03	0.35	0.76	**1.00**						
Private Equity	0.80	0.80	0.76	0.78	0.76	0.74	-0.10	-0.19	-0.21	0.15	-0.01	-0.14	0.59	0.06	0.43	0.60	0.62	**1.00**					
Private Credit	0.74	0.73	0.70	0.72	0.70	0.69	0.00	-0.06	-0.10	0.28	0.12	-0.09	0.63	0.06	0.48	0.56	0.52	0.68	**1.00**				
Hedge Funds	0.78	0.78	0.73	0.76	0.74	0.73	0.10	0.14	0.07	0.39	0.27	0.09	0.64	0.05	0.55	0.52	0.47	0.60	0.61	**1.00**			
Commodities	0.26	0.26	0.25	0.25	0.25	0.25	-0.10	-0.10	-0.10	0.01	-0.04	0.10	0.15	0.15	0.19	0.21	0.18	0.23	0.17	0.23	**1.00**		
Cash Equiv	-0.06	-0.06	-0.08	-0.10	-0.10	-0.10	0.30	0.15	0.08	-0.05	0.01	0.12	-0.11	0.00	-0.07	0.00	-0.07	0.00	-0.06	-0.04	-0.02	**1.00**	
Inflation	-0.01	-0.02	0.02	0.01	0.00	0.03	-0.21	-0.25	-0.23	-0.25	-0.26	0.08	0.05	-0.10	0.00	0.10	0.06	0.06	0.06	0.15	0.29	0.05	**1.00**

– Relationships between asset classes are as important as standard deviation

– To determine portfolio mixes, Callan employs mean-variance optimization

– Return, standard deviation, and correlation determine the composition of efficient asset mixes

- Source: Callan

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