Bryant University

HONORS THESIS

The Interaction Between Spending Policies and Asset Allocation for College and University Endowments

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_ Submitted in partial fulfillment of the requirements for graduation
with honors in the Bryant University Honors Program
April 2023

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ABSTRACT

The analysis revealed better combinations of asset allocation and spending policy for college and university endowments that efficiently balance the desirable outcomes of stable spending in real terms against maintaining the purchasing power of the endowment over time (intergenerational equity). Using the variability and correlation of historical asset class returns, we created a forward-looking, projection-based, multivariate Monte Carlo simulation of individual asset class returns. The simulation incorporates the relationships between inflation and asset class returns, and the relationships among asset class returns. The projected time series of asset class returns produced a time series of endowment portfolio returns given an asset allocation. Applying a spending policy to each time series of portfolio returns generated the associated time series of spending and endowment values in nominal and inflation-adjusted terms. We tested 18 different endowment combinations (6 asset allocations x 3 spending policies) to examine three crucial endowment management decisions concerning: alternative assets in asset allocation, equity assets in asset allocation, and inflation factors in spending policy. Our findings suggest that inflation-adjusted spending policies combined with portfolios that include alternative assets and greater equity allocations are better for achieving intergenerational equity. In addition to the specific combinations studied, the simulation engine that was developed can be extended and utilized to test multiple additional asset allocation and spending policy combinations to further our understanding of this important issue.

INTRODUCTION

David Swensen, Chief Investment Officer of the Yale University endowment from 1985 until his death in 2021, describes the fundamental tradeoff between asset allocation and spending policy in his book *Pioneering Portfolio Management*: the goal of spending from the endowment is to provide for the institution's operating budget today, while asset allocation aims to preserve the purchasing power of the endowment's assets over time (Swensen, 2000). In effect, spending on higher education programs in the present will reduce the assets available to future generations.

LITERATURE REVIEW

Endowments in Higher Education

The modern interpretation of the role of endowments in higher education was popularized by Yale economist James Tobin, who established the concept of intergenerational equity in 1974. Tobin proposed that the purpose of endowments in higher education institutions is to provide equal opportunities and resources for both present and future generations of students. This perspective underscores the objective of college and university endowment management: to efficiently balance the desire for stable spending in real terms versus maintaining the purchasing power of the endowment over time (Tobin, 1974).

The ultimate responsibility for managing and overseeing an endowment lies with a college or university's Board of Trustees. The board's main functions in relation to endowment management include: (1) developing the investment policy statement, which defines the investable universe of asset classes and their target weights, and (2) establishing a spending policy that determines the methodology and extent of the endowment's contribution to the institution's current operating budget. While the board is responsible for setting the endowment's long-term asset allocation plan, the day-to-day individual asset class management issues are typically delegated to an Investment Committee overseeing an internal investment office (e.g., Yale Investments Office, Dartmouth Investment Office), headed by an

internal Chief Investment Officer, or to an investment firm commonly referred to as an Outsourced Chief Investment Office (OCIO). Alternatively, these responsibilities can be assigned to a separate formally constituted Investment Company (e.g., Harvard Management Company, University of Texas Investment Management Company) that reports directly to the board (Brown et al., 2007). Nevertheless, these offices or companies typically delegate the management of each asset class-specific portfolio to external managers (Brown et al., 2007).

To explain multi-asset investment portfolio performance, Brinson et al. (1986), proposed a method that examines three key components of the investment management process: the long-term (strategic) asset allocation plan, the timing of (tactical) asset allocation adjustments, and the selection of investments within an asset class. Applying this methodology to 91 large U.S. pension plans during the 1974-1983 period, the researchers discovered that the "passive" management decision of strategic asset allocation accounted for the majority of the portfolio performance over time, while "active" management decisions, such as timing and security selection, had minimal average impact on improving performance. Brinson et al. (1991) updated these results for the 1978-1987 period and reached similar conclusions. Ibbotson and Kaplan (2000) further confirmed the significance of strategic asset allocation in pension and mutual fund performance, and that the influence of active management decisions was relatively limited during the 1988-1998 period.

Brown et al. (2010) applied a similar methodology to endowment returns in their sample from 1984 to 2005 and observed that active management had a pronounced effect on returns. They emphasized that successful security selection across the entire asset class universe, rather than returns from a few select market segments such as alternative assets, was the key determinant of an endowment's overall success. In this context, the passive element of endowment management takes place at the Board or Investment Committee level through the strategic asset allocation decision. On the other hand, a critical active decision within the endowment management process is made by the Chief Investment Officer, who is responsible for selecting external investment managers to oversee specific asset class allocations. Those external managers are then responsible for active security selection within their portfolios.

Brown et al. (2010) found that, compared to mutual or pension funds in their sample, endowment management exhibited a more active strategy, and they attributed this to endowments tending to overweight asset classes where they appeared to have superior active management skills.

In *Pioneering Portfolio Management*, Swensen underscores the significance of a well-constructed strategic asset allocation as a foundation for a strong portfolio management framework. He explains that market timing actions (or tactical asset allocation) typically yield poor results, prompting serious investors to avoid them. Conversely, Swensen notes that although consistently executing security selection decisions can be challenging, they offer the potential to enhance a portfolio's return through engaging high-quality managers and appropriately structuring investment relationships (Swensen, 2000).

Asset Allocation

This paper focuses on the strategic asset allocation plan set by the Board of Trustees or Investment Committee. Traditionally, endowments had primarily invested in public equities and fixed-income asset classes. Thaler and Williamson (1994) cited the 1993 NACUBO (National Association of College and University Business Officers) Endowment Study, which reported that the common asset allocation among major U.S. endowment funds was approximately 60% in equities and equity-like assets, and 40% in fixed-income, cash, and similar assets. They argued that this allocation was too conservative to maintain purchasing power for posterity and urged for a shift towards increased equity allocations, echoing the sentiments of The Ford Foundation's 1967 Barker Report, which had first argued against conservatism in endowment investment management (Thaler & Williamson, 1994).

By the early 2000s, endowments began adopting a more comprehensive approach to asset allocation, popularized in large part by David Swensen's successful management of the Yale University endowment. In his book, Swensen draws on his extensive experience as the Chief Investment Officer outlining the Yale Model – an approach that emphasizes alternative assets and active management. Swensen highlights two primary reasons for including alternative

investments in endowment asset allocation: (1) well-selected private investments offer opportunities to enhance growth, with the understanding that higher expected returns may be accompanied by greater risk, and (2) real assets and other alternative strategies offer opportunities for diversification by producing returns influenced by factors different from those determining the outcomes of other asset classes. Consequently, the inclusion of alternative investments can potentially lead to improved risk-adjusted returns (Swensen, 2000).

Swensen's emphasis on alternative investments in endowment asset allocation proved to be effective during his tenure as Chief Investment Officer. When he assumed the role in 1985, the endowment contributed $45 million to Yale's budget, representing a century-low 10% of revenue. By 2009, the endowment transferred approximately $1.15 billion to the budget, accounting for about 45% of revenue (Swensen, 2000). According to NACUBO (2002; 2022), endowments have increased allocations in alternative assets from 10% in 2002 to 33% in 2022 on an equal-weighted average basis, and from 24% in 2002 to 59% in 2022 on a dollar-weighted average basis. This trend illustrates the growing preference for alternative assets, particularly among larger endowments. Brown et al. (2007) posited that smaller endowments might not have enough capital to hire managers with the necessary expertise in alternative assets or may not meet the minimum investment requirements specific to some hedge funds. The researchers added that endowments with a larger asset base are likely to be better equipped to manage the illiquid nature of the private equity asset class and to allocate more resources for researching such investments (Brown et al., 2007). A comparison of endowment asset allocations from NACUBO for 1993, 2002, and 2022 are presented in Table 1.

Table 1 – NACUBO Endowment Asset Allocations

2022	**Public Equity**	**Fixed-Income**	**Alternatives**	**Other**
Dollar-weighted Average	28%	11%	59%	3%
Equal-weighted Average	46%	19%	33%	1%

2002	**Public Equity**	**Fixed-Income**	**Alternatives**	**Other**
Dollar-weighted Average	50%	25%	24%	1%
Equal-weighted Average	57%	31%	10%	2%

1993	**Public Equity**	**Fixed-Income**	**Alternatives**	**Other**
Dollar-weighted Average	-	-	-	-
Equal-weighted Average	53%	42%	4%	1%

Spending Policy

Prior to the Uniform Management of Institutional Funds Act (UMIFA) of 1972, endowment funds were limited to spending only investment income, which included interest from bonds and dividends from stocks (Thaler & Williamson, 1994). UMIFA permitted endowments to spend a "prudent" portion of capital gains in addition to investment income, provided that the endowment's principal value was maintained (Thaler & Williamson, 1994). As a result, many endowments adopted a moving average spending policy, which entails spending a percentage (approximately 4% to 5%) of a 3 to 5 year moving average of endowment value (Thaler & Williamson, 1994; Sedlacek & Jarvis, 2010). By the start of the 2000s, 65% of college and university endowments were utilizing a moving average spending policy (Sedlacek & Jarvis, 2010).

In 2003, Commonfund, a prominent asset management firm focused on serving endowments, foundations, and other institutional investors, including acting as an Outsourced Chief Investment Officer (OCIO) for some clients, released the research white paper, "Why Do We Feel So Poor?" (Sedlacek & Clark, 2003). As higher education institutions faced declining real spending from endowments in the early 2000s, the researchers employed a forward-looking Monte Carlo simulation to evaluate the performance of various spending policies. They recommended that endowment management reconsider the moving average policy and explore inflation-based policies as potentially more viable options (Sedlacek & Clark, 2003).

In 2006, UMIFA statutes were updated to the current Uniform Prudent Management of Institutional Funds Act (UPMIFA), permitting endowments to spend as much as the board deemed prudent, including principal (Sedlacek & Jarvis, 2010). Despite the introduction of UPMIFA, the moving average spending policy remained the predominant approach, with approximately three-quarters of endowments adhering to it from 2006 to 2010 (Sedlacek & Jarvis, 2010). The historical popularity of the moving average spending policy can be attributed to its simplicity and relatively straightforward calculation (Sedlacek & Clark, 2003; Sedlacek & Jarvis, 2010). However, Sedlacek & Jarvis (2010) noted an emerging trend among a handful of the largest endowments, including Stanford, Harvard, and Yale; they instituted more flexible spending policies, including inflation-based or hybrid spending policies that combine the moving average and inflation-based approaches. Nonetheless, in 2021 the moving average spending policy continued to be the choice for approximately three-quarters of endowments (Commonfund, 2022).

Spending Policies and Asset Allocation

In March 2022, Commonfund released the research white paper "Endowment Spending Policy: Often Overlooked but Critical to Long-Term Success" (Commonfund, 2022). This study tested two combinations of asset allocation and spending policy, presented in Table 2: (1) a 70% equity, 30% fixed-income allocation, with a moving average spending policy of a 5% draw of a 12-quarter moving average of the endowment market value versus (2) a 90% equity, 10% fixed-income allocation, with a hybrid spending policy of 80% weighted to inflation-adjusted prior spending and 20% weighted to a 5% draw from the current endowment market value.

Table 2 – Commonfund, 2022 Endowment Combinations

Asset Class	70% Equity, Moving Average Spending	90% Equity, Hybrid Spending
Public Equity	30%	50%
Private Equity	40%	40%
Core Bonds	30%	10%

Utilizing a forward-looking, projection-based Monte Carlo simulation, the study examined these two endowment combinations through 10,000 simulation paths representing various possible future outcomes. Commonfund argues that fluctuations in spending pose a greater risk to colleges and universities than volatility in the portfolio's value, and their findings demonstrated that a greater equity allocation enhanced investment performance, while a hybrid spending policy helped mitigate the impact of increased equity risk on the operating budget (Commonfund, 2022). The significance of their study lies in its application of a Monte Carlo simulation-based framework to investigate the intricate relationship between spending policy, asset allocation, and endowment performance. The analysis presented in this paper expands on Commonfund (2022) by examining a wider array of asset allocation and spending policy combinations, including a more comprehensive set of alternative assets.

METHODOLOGY

Methodology Summary

The methodology used to simulate future outcomes of a given asset allocation and spending policy is here summarized, with subsequent sections delving into each in greater detail.

1) We sourced historical individual asset class returns and statistically analyzed their variability and correlation with each other.
2) We used a multivariate Monte Carlo simulation to generate 10,000 paths, each of which includes a 120 quarter (30 year) time series of asset class returns.
3) For each simulated return history, we created a time series of portfolio returns given an asset allocation.
4) We applied a spending policy to each time series of portfolio returns to get the time series of spending and the value of the endowment.
5) We evaluated the distribution of returns, spending, and the terminal value of the endowment in inflation-adjusted terms.

Historical Data Utilized

Table 3 presents the individual asset classes utilized in this study, along with their respective annualized returns and annualized standard deviations (volatility) for the period spanning from December 31, 2000, to December 31, 2022. Publicly traded asset returns were obtained from Bloomberg, while alternative asset returns were obtained from a combination of Bloomberg and Preqin.

Table 3 – Historical Asset Class Returns & Volatility

Asset Class	Returns	Volatility	Source
Inflation (CPI)	2.47%	1.51%	Bloomberg
US Large Cap Equity (Russell 1000)	5.13%	17.31%	Bloomberg
US Small Cap Equity (Russell 2000)	6.05%	22.28%	Bloomberg
Developed International Equity (MSCI EAFE)	1.21%	19.11%	Bloomberg
Emerging Market Equity (MSCI EM)	4.90%	23.39%	Bloomberg
Cash (3-Month T-Bill)	1.37%	0.80%	Bloomberg
US Core Bonds (Bloomberg USAgg)	3.65%	4.06%	Bloomberg
US High Yield Debt (US Corporate High Yield)	6.77%	10.50%	Bloomberg
Private Equity Composite	10.57%	9.19%	Preqin
Private Equity Buyout Strategy	12.05%	9.78%	Preqin
Private Equity Growth Strategy	10.22%	10.99%	Preqin
Private Equity Venture Strategy	4.98%	11.11%	Preqin
Private Equity Distressed Strategy	10.15%	9.38%	Preqin
Hedge Fund (HFRI Weighted Composite)	1.94%	6.27%	Bloomberg
Real Estate	7.32%	10.81%	Preqin
Commodities (Bloomberg Commodity)	1.30%	18.32%	Bloomberg
Natural Resources	9.46%	11.52%	Preqin

Forecasting The Relationships Between Asset Class Returns

To capture historical relationships between individual asset class returns, we used linear regression analysis. This framework allows us to capture the average relationship between different asset classes while utilizing the standard deviation of the residual to generate the variability in the Monte Carlo simulation. A total of 16 regressions were employed to parameterize the simulation. Only variables that were part of the group of asset class returns were used in the regressions since those were the only variables that would then have simulated return paths in the Monte Carlo analysis. For example, we did not utilize economic growth or unemployment to predict inflation or asset class returns – that was not within the scope of this study. The aim here was not to develop the most optimal forecasting model for asset class returns. The primary objective was to create a sensible model that would capture

the observed historical asset class average returns, standard deviations, and correlations. This approach enables the Monte Carlo simulation to produce a distribution of returns that is grounded by historical statistics. It should be noted that certain relationships exhibited a better fit than others. Regression results are presented in Table 4.

Table 4 – Regression Results

Dep. Variable	Int.	Ind. Variable (Coeff., P-Value)	R^2	F	SD Residuals
Inflation	0.0043	CPI Index % Change YoY Lagged (0.0756, 0.0934)	3.24%	2.89	0.0074
US Large Cap Equity	0.0006	Real Interest Rate Lagged (0.9247, 5E-43***)	89.30%	709.67	0.0037
US Small Cap Equity	0.0016	Large Cap (1.1927, 3E-38***)	85.84%	521.38	0.0419
Developed International Equity	-0.0086	Large Cap (0.9900, 4E-32***)	80.38%	352.26	0.0423
Emerging Market Equity	0.0011	Large Cap (1.0882, 3E-21***)	64.82%	158.43	0.0694
Cash	0.0013	US 10 Year Yield (0.2420, 0.0134*) US 10 Year Yield Quarterly Change (-3.5491, 5E-26***)	73.23%	116.26	0.0105
US Core Bonds	0.0045	Aggregate Bond (0.6167, 0.0011**) Small Cap (0.3617, 1E-17***)	58.39%	59.64	0.0339
US High Yield Debt	0.0013	Large Cap (0.2655, 3E-16***)	54.09%	101.31	0.0212
Private Equity Composite	0.0185	Small Cap (0.2834, 2E-14***) Small Cap Lagged (0.1171, 2E-04***)	53.35%	48.02	0.0314
Private Equity Buyout Strategy	0.0061	Small Cap (0.2497, 4E-07***) Small Cap Lagged (0.1274, 0.0059**)	30.32%	18.28	0.0464
Private Equity Growth Strategy	0.0215	Small Cap (0.3111, 2E-15***) Small Cap Lagged (0.1185, 3E-04***)	55.67%	52.75	0.0326
Private Equity Venture Strategy	0.0182	Small Cap (0.2671, 2E-08***) Small Cap Lagged (0.1313, 0.0031**)	34.97%	22.58	0.0443
Private Equity Distressed Strategy	0.0191	Small Cap (0.2573, 2E-10***) Small Cap Lagged (0.0679, 0.0603)	39.06%	26.92	0.0366
Hedge Fund	-0.0106	Large Cap (1.1023, 3E-04***) CPI Index Quarterly % Change (0.2280, 4E-04***)	21.59%	11.57	0.0479
Real Estate	-0.0390	Large Cap (0.3907, 1E-05***) CPI Index Quarterly % Change (6.5412, 1E-09***)	47.35%	38.22	0.0665
Commodities	0.0038	Large Cap (0.2658, 3E-05***) CPI Index Quarterly % Change (2.7222, 0.0001***)	32.33%	20.07	0.0474

Simulating Asset Class Returns and Endowment Portfolio

Having sourced historical individual asset class returns and statistically analyzed their variability and correlation with each other through linear regression analysis, we use the coefficients from the regression, and the standard deviation of the residuals to parameterize a multivariate Monte Carlo simulation that generates a 120 quarter (30 year) time series of returns for inflation and for each asset class 10,000 times. The slope coefficients from the regression capture the correlations, and residual standard deviation generates the uncertainty. The simulation incorporates the relationships between inflation and asset class returns, using inflation, real interest rates, and large cap equity returns as the primary drivers in the simulation. The linkage works as follows: expected inflation at any given time is modeled as a weighted average of past inflation; the nominal 10-year Treasury is then equal to a real interest rate plus expected inflation, with the real interest rate simulated based upon an assumed mean, autocorrelation, and standard deviation; large cap equity returns are then modeled as a required expected return equal to the nominal rate plus an equity risk premium, which has its own mean and standard deviation, and an unexpected price return inversely related to the change in the required return; finally, all other asset class returns are related to one or more of these primary variables (inflation, the 10-year Treasury yield, and large cap equity returns) via the regression parameters. The average of annualized returns and average of annualized standard deviations (volatility) of the individual asset classes utilized through the simulation's 10,000 paths are presented in Table 5.

Table 5 – Simulated Asset Class Returns and Volatility

Asset Class	Hist. Returns	Hist. Volatility	Sim Returns	Sim Volatility
Inflation (CPI)	2.49%	1.49%	2.47%	1.51%
US Large Cap Equity (Russell 1000)	8.27%	16.73%	5.13%	17.31%
US Small Cap Equity (Russell 2000)	9.91%	21.63%	6.05%	22.28%
Developed International Equity (MSCI EAFE)	4.20%	18.58%	1.21%	19.11%
Emerging Market Equity (MSCI EM)	8.33%	22.82%	4.90%	23.39%
Cash (3-Month T-Bill)	2.52%	0.72%	1.37%	0.80%
US Core Bonds (Bloomberg USAgg)	3.59%	5.63%	3.65%	4.06%
US High Yield Debt (US Corporate High Yield)	7.93%	11.75%	6.77%	10.50%
Private Equity Composite	12.31%	9.11%	10.57%	9.19%
Private Equity Buyout Strategy	13.94%	9.68%	12.05%	9.78%
Private Equity Growth Strategy	11.90%	10.94%	10.22%	10.99%
Private Equity Venture Strategy	6.50%	11.03%	4.98%	11.11%
Private Equity Distressed Strategy	11.57%	9.28%	10.15%	9.38%
Hedge Fund (HFRI Weighted Composite)	2.86%	6.12%	1.94%	6.27%
Real Estate	9.30%	4.80%	7.32%	10.81%
Commodities (Bloomberg Commodity)	3.84%	10.57%	1.30%	18.32%
Natural Resources	11.05%	5.37%	9.46%	11.52%

Monte Carlo methods simulate different values of uncertain variables over a large number of observations to create a distribution of possible outcomes, capturing the unpredictability of future asset class returns and enabling the analysis of a diverse set of potential outcomes beyond a specific time period. In all, we had 18 Monte Carlo simulations, one for each combination tested (6 asset allocations x 3 spending policies). Each combination references the same set of 10,000 asset class return paths, allowing for a consistent comparison between the combinations tested.

Asset Allocations Tested

For each simulated return history, we created a time series of portfolio returns given an asset allocation. Table 6 presents the asset allocations tested: Publicly Traded Assets Only, Publicly Traded & Alternative Assets, and Detailed Publicly Traded & Alternative Assets, each with 70% and 90% total equity allocations are presented. Rebalancing to the target asset allocation involves a rule that partially moves ending asset percentages back to targets each quarter, with traditional publicly traded assets moving 90% of the way and alternative assets moving 50%.

Table 6 – Asset Allocations Tested

Publicly Traded Assets Only	**70% Equity Assets**	**90% Equity Assets**
US Large Cap Equity	40%	51%
US Small Cap Equity	12%	16%
Developed International Equity	10%	13%
Emerging Market Equity	8%	10%
US Core Bonds	27%	8%
Cash	3%	2%

Publicly Traded & Alternative Assets	**70% Equity Assets**	**90% Equity Assets**
US Large Cap Equity	28%	36%
US Small Cap Equity	10%	13%
Developed International Equity	7%	9%
Emerging Market Equity	5%	7%
US Core Bonds	17%	5%
Cash	3%	2%
Private Equity Composite	20%	25%
Real Estate	8%	2%
Hedge Fund	2%	1%

Detailed Publicly Traded & Alternative Assets	**70% Equity Assets**	**90% Equity Assets**
US Large Cap Equity	28%	36%
US Small Cap Equity	10%	13%
Developed International Equity	7%	8%
Emerging Market Equity	5%	7%
US Core Bonds	14%	3%
US High Yield Debt	3%	1%
Cash	3%	2%
Private Equity Buyout Strategy	7%	9%
Private Equity Growth Strategy	6%	8%
Private Equity Venture Strategy	4%	5%
Private Equity Distressed Strategy	3%	3%
Commodities	1%	1%
Natural Resources	1%	1%
Real Estate	6%	2%
Hedge Funds	2%	1%

Spending Policies Tested

We applied a spending policy to each time series of portfolio returns to obtain the time series of spending and the value of the endowment in nominal and inflation-adjusted terms. This study investigates three distinct spending policies. The Moving Average Policy utilizes a quarterly spending draw equal to 1.125% of a 12-quarter trailing moving average of endowment market value, which equates to a 4.5% annual spend rate and is within the typical range for endowment spending. The Banded Inflation Policy is the last quarter's spending increased by the inflation rate but bounded by a lower band of 1% and an upper band of 1.25% of the 12-quarter moving average of the endowment value. The Hybrid Policy is a combination of the two, with 80% weighted to inflation-adjusted spending and 20% weighted to 1.125% of the 12-quarter trailing moving average of market value. This Hybrid policy resembles the one employed in Commonfund (2022) and referenced by Swensen (2000). Table 7 presents the spending policies tested.

Table 7 – Spending Policies Tested

Method	**Definition**
Moving Average	Quarterly spending draw equal to 1.125% of a 12-quarter trailing moving average of endowment market value.
Banded Inflation	Last quarter’s spending increased by the inflation rate but bounded by a lower band of 1% and an upper band of 1.25% of the 12-quarter moving average of the endowment value
Hybrid	80% weighted to inflation-adjusted spending and 20% weighted to 1.125% of the 12-quarter trailing moving average of market value.

RESULTS

Results Summary

Table 8 presents the statistics produced from our multivariate Monte Carlo simulation. As previously mentioned, we tested 18 distinct endowment combinations (6 asset allocations x 3 spending policies). Appendix A includes these detailed results. In the following subsections, we use a subset of these results to examine three crucial endowment management decisions concerning: alternative assets in asset allocation, equity assets in asset allocation, and inflation factors in spending policy.

Table 8 – Simulation Statistics

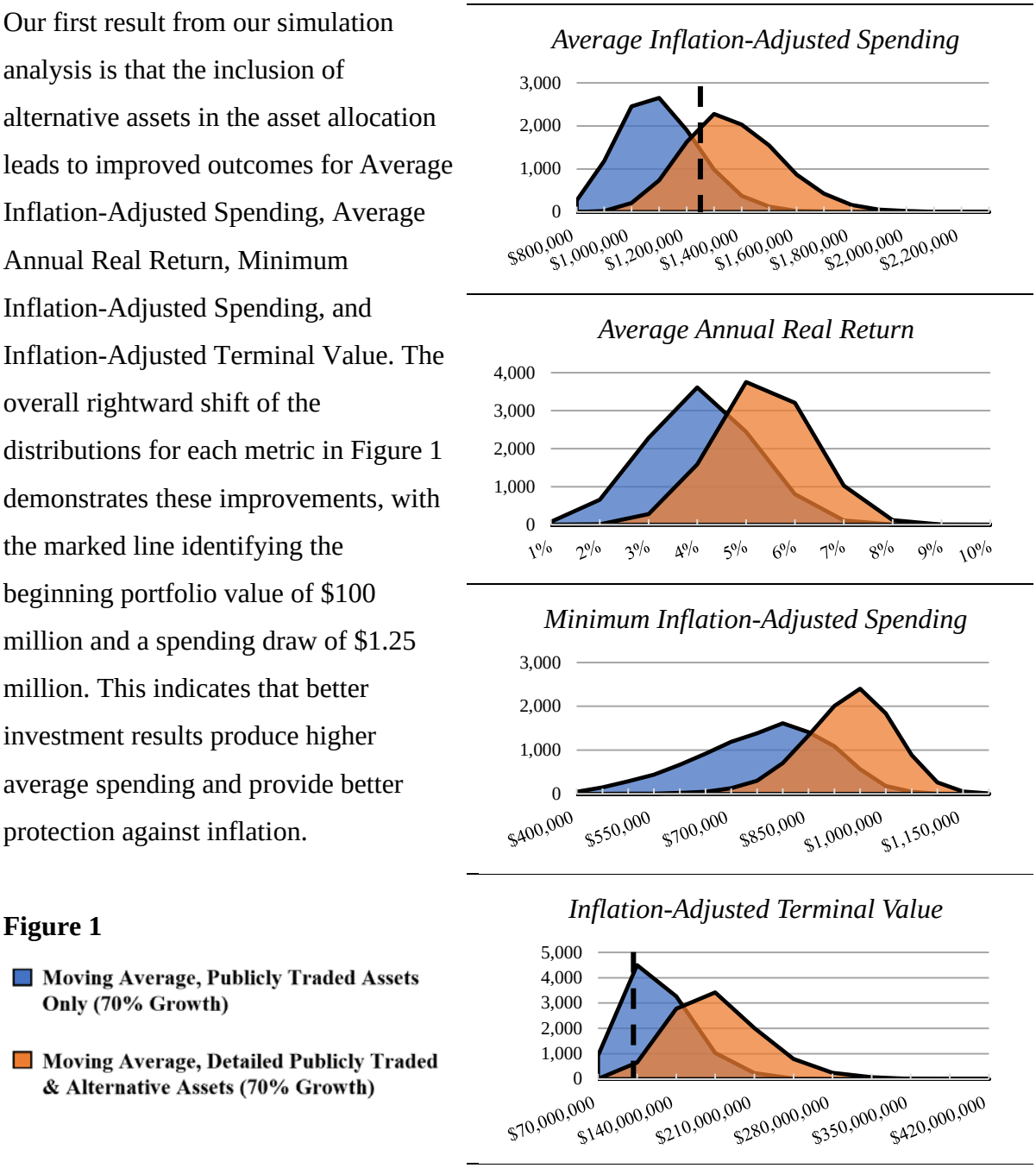
	Minimum	**Maximum**	**Average**
Average Annual Portfolio Return	-	-	-
Average Annual Inflation	-	-	-
Average Annual Real Return	-	-	-
Annual Portfolio Return Standard Deviation	-	-	-
Average Inflation-Adjusted Spending	-	-	-
Minimum Inflation-Adjusted Spending	-	-	-
Average Inflation-Adjusted Spending Drawdown	-	-	-
Maximum Inflation-Adjusted Spending Drawdown	-	-	-
Average Inflation-Adjusted Portfolio Value Drawdown	-	-	-
Maximum Inflation-Adjusted Portfolio Value Drawdown	-	-	-
Inflation-Adjusted Terminal Value	-	-	-

Furthermore, the simulated outcomes for the allocations of Publicly Traded & Alternative Assets and the Detailed Publicly Traded & Alternative Assets were remarkably similar. The detailed asset allocation also reflects what is typically observed at very large endowments. Thus, we will use only the latter for comparison in the following subsections.

Alternative Assets in Asset Allocation

Our first result from our simulation analysis is that the inclusion of alternative assets in the asset allocation leads to improved outcomes for Average Inflation-Adjusted Spending, Average Annual Real Return, Minimum Inflation-Adjusted Spending, and Inflation-Adjusted Terminal Value. The overall rightward shift of the distributions for each metric in Figure 1 demonstrates these improvements, with the marked line identifying the beginning portfolio value of $100 million and a spending draw of $1.25 million. This indicates that better investment results produce higher average spending and provide better protection against inflation.

Figure 1



Equity Assets in Asset Allocation

The second result is that increasing the allocation to equity assets leads to improved outcomes for: Average Inflation-Adjusted Spending, Average Annual Real Return, Minimum Inflation-Adjusted Spending, and Inflation-Adjusted Terminal Value. This again indicates that better investment results produce higher average spending and provide better protection against inflation.

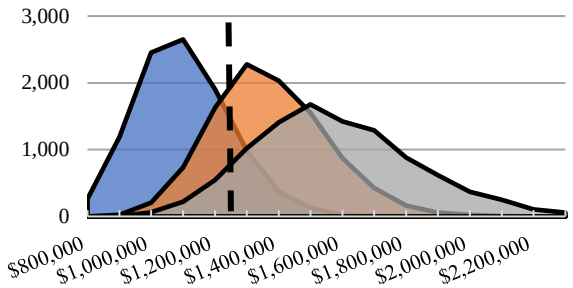
Figure 2

Moving Average, Publicly Traded Assets Only (70% Growth)

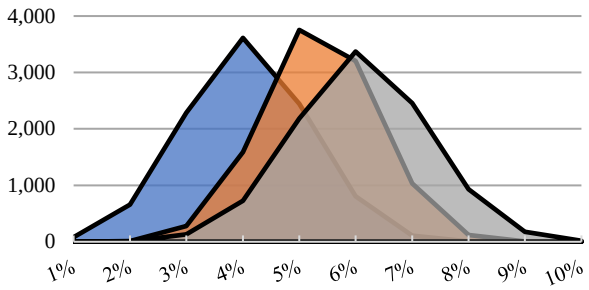
Moving Average, Detailed Publicly Traded & Alternative Assets (70% Growth)

Moving Average, Detailed Publicly Traded & Alternative Assets (90% Growth)

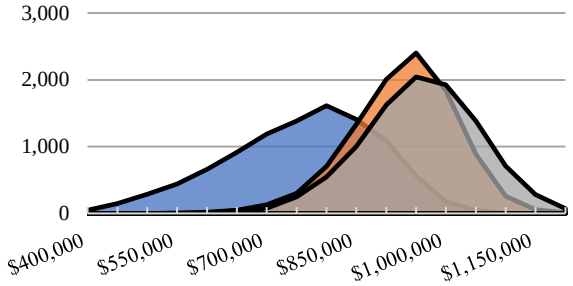
Average Inflation-Adjusted Spending



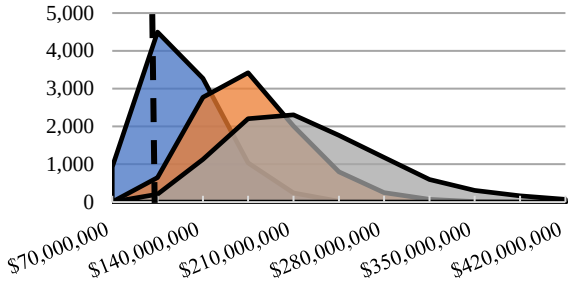
Average Annual Real Return



Minimum Inflation-Adjusted Spending



Inflation-Adjusted Terminal Value

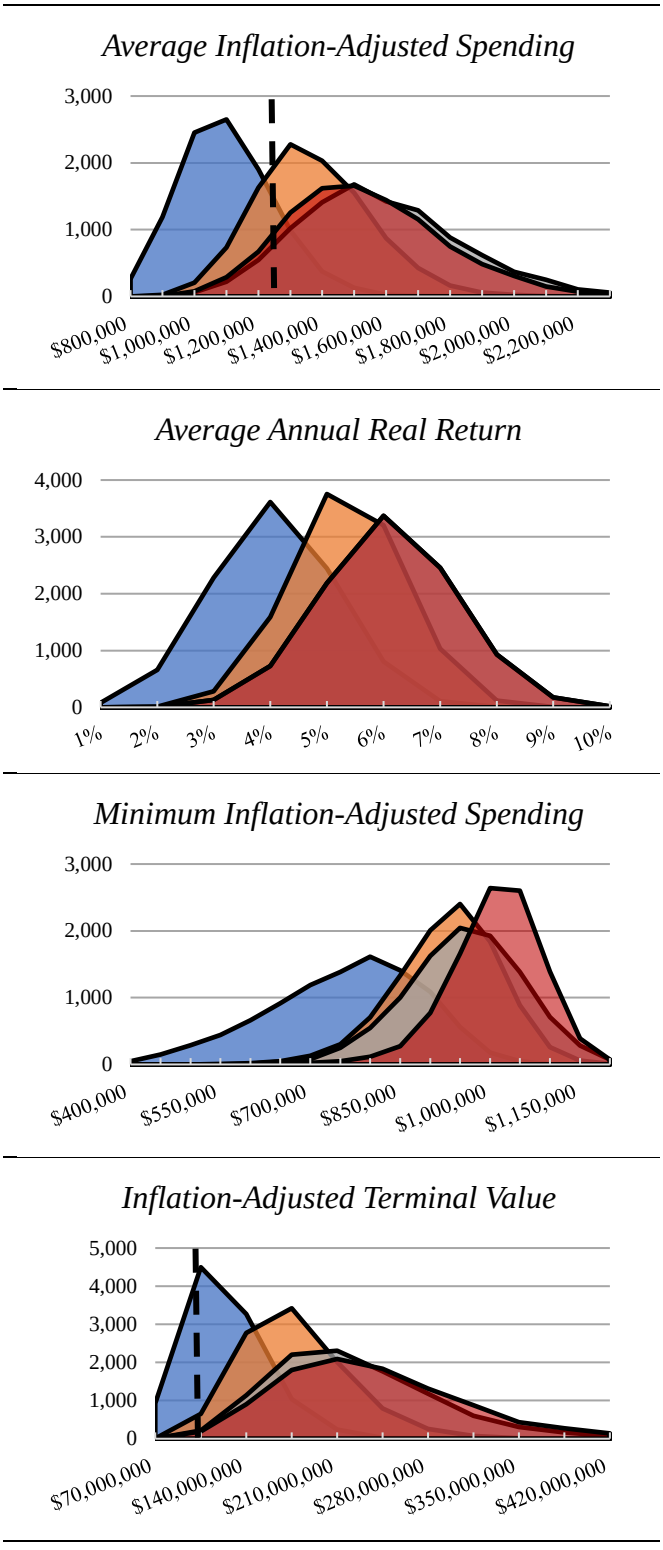


Inflation Factors in Spending Policy

Our third result is that utilizing an inflation-adjusted spending policy improved outcomes for Minimum Inflation-Adjusted Spending, with similar outcomes for Average Inflation-Adjusted Spending and Inflation-Adjusted Terminal Value. There was no change in Average Annual Real Return, as spending policy cannot alter investment results. This indicates that inflation factors in spending policy improve the endowment's ability to provide stable spending in real terms. Figure 3 depicts a Banded Inflation policy, as it slightly outperformed the Hybrid in our analysis; further consideration is provided in the subsequent drawdown comparison.

Figure 3

- **Moving Average, Publicly Traded Assets Only (70% Growth)**
- **Moving Average, Detailed Publicly Traded & Alternative Assets (70% Growth)**
- **Moving Average, Detailed Publicly Traded & Alternative Assets (90% Growth)**
- **Banded Inflation, Detailed Publicly Traded & Alternative Assets (90% Growth)**



To further illustrate the effectiveness of an inflation-adjusted spending policy we also performed a drawdown comparison. Maximum Drawdown is the maximum peak to trough change in a time series. The Average Maximum Drawdown is the average of the Maximum Drawdowns across the 10,000 paths. Worst Maximum Drawdown is the worst-case scenario across all 10,000 paths.

Table 9 – Drawdown Comparison

Spending Policy:	Moving Average			Hybrid	Banded Inflation
Asset Allocation:	Publicly Traded Assets Only (70% Equity)	Detailed Publicly Traded & Alternative Assets (70% Equity)	Detailed Publicly Traded & Alternative Assets (90% Equity)	Detailed Publicly Traded & Alternative Assets (90% Equity)	Detailed Publicly Traded & Alternative Assets (90% Equity)
Average Maximum Drawdown					
Inf. Adj. Portfolio Value	-23.75%	-14.49%	-15.11%	-15.04%	-14.63%
Inf. Adj. Spending	-16.15%	-7.93%	-7.39%	-5.48%	-2.12%
Worst Maximum Drawdown					
Inf. Adj. Portfolio Value	-77.50%	-68.18%	-73.08%	-73.92%	-74.25%
Inf. Adj. Spending	-71.65%	-59.11%	-63.36%	-60.00%	-56.24%

A crucial role of spending policies is to smooth the variability of spending relative to the variability of portfolio values while placing the utmost importance on mitigating potential downside. Policies that incorporate inflation adjustments (Hybrid and Banded Inflation) perform much better than Moving Average policies in reducing the transmission of portfolio losses to spending declines in inflation-adjusted terms. In particular, the Banded Inflation Policy significantly reduced the Average Maximum Drawdown in spending (-2.12%) relative to portfolio value (-14.63%) as well as the Worst Maximum Drawdown in spending (-56.24%) relative to portfolio value (-74.25%). This comparison further illustrates that better investment results produced higher average spending and provided better protection against inflation, as the endowments that included alternatives and greater equity allocations better mitigated drawdown compared to the Publicly Traded Assets Only portfolio.

SUMMARY AND CONCLUSION

The goal of this research was to reveal better combinations of asset allocation and spending policy for college and university endowments that efficiently balance the desirable outcomes of stable spending in real terms against maintaining the purchasing power of the endowment over time (intergenerational equity). We tested 18 endowment combinations (6 asset allocations x 3 spending policies) using a forward-looking, projection-based, multivariate Monte Carlo simulation built on the variability and correlation of historical asset class returns. Our analysis examined three crucial endowment management decisions.

1) Including alternative assets in the asset allocation resulted in better investment returns, producing higher average inflation-adjusted spending, thereby providing better protection against inflation.
2) Increasing the allocation to equity assets resulted in better investment returns, producing higher average inflation-adjusted spending, thereby providing better protection against inflation.
3) To mitigate the associated risk with greater allocations to alternative and equity assets, replacing a moving average spending policy with one incorporating an inflation factor significantly reduced the variability of spending relative to portfolio value.

Considering our summarized findings, we conclude that inflation-adjusted spending policies combined with portfolios that include alternative assets and greater equity allocations are better for achieving intergenerational equity.

APPENDICIES

Appendix A – Simulated Endowment Combinations

Note. beginning portfolio value of $100 million and a spending draw of $1.25 million.

Publicly Traded Assets Only (70% Equity), Moving Average Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	2.93%	11.21%	7.04%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	0.49%	8.30%	4.55%
Annual Portfolio Return Standard Deviation	10.03%	16.2 3%	12.97%
Average Inflation-Adjusted Spending	$737,332.84	$1,970,918.62	$1,150,950.79
Minimum Inflation-Adjusted Spending	$407,573.57	$1,212,160.71	$882,681.95
Average Inflation-Adjusted Spending Drawdown	-48.72%	-1.80%	-16.15%
Maximum Inflation-Adjusted Spending Drawdown	-71.65%	-9.17%	-34.95%
Average Inflation-Adjusted Portfolio Value Drawdown	-54.81%	-8.33%	-23.75%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-77.50%	-22.47%	-47.34%
Inflation-Adjusted Terminal Value	$33,709,303.82	$262,289,889.77	$105,958,151.44

Publicly Traded Assets Only (70% Equity), Banded Inflation Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	2.93%	11.21%	7.04%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	0.49%	8.30%	4.55%
Annual Portfolio Return Standard Deviation	10.03%	16.23%	12.97%
Average Inflation-Adjusted Spending	$765,379.81	$1,987,567.19	$1,139,021.01
Minimum Inflation-Adjusted Spending	$432,954.00	$1,292,631.48	$959,077.06
Average Inflation-Adjusted Spending Drawdown	-40.93%	0.00%	-9.68%
Maximum Inflation-Adjusted Spending Drawdown	-66.78%	0.00%	-21.93%
Average Inflation-Adjusted Portfolio Value Drawdown	-56.77%	-7.98%	-23.99%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-78.51%	-22.21%	-47.78%
Inflation-Adjusted Terminal Value	$31,500,505.17	$275,258,804.69	$106,386,766.44

Publicly Traded Assets Only (70% Equity), Hybrid Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	2.93%	11.21%	7.04%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	0.49%	8.30%	4.55%
Annual Portfolio Return Standard Deviation	10.03%	16.23%	12.97%
Average Inflation-Adjusted Spending	$743,033.57	$1,954,450.98	$1,147,019.71
Minimum Inflation-Adjusted Spending	$409,810.93	$1,241,422.90	$905,789.73
Average Inflation-Adjusted Spending Drawdown	-45.01%	-0.99%	-14.08%
Maximum Inflation-Adjusted Spending Drawdown	-70.95%	-6.02%	-31.08%
Average Inflation-Adjusted Portfolio Value Drawdown	-55.75%	-8.12%	-24.07%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-78.60%	-22.16%	-47.78%
Inflation-Adjusted Terminal Value	$32,344,237.63	$268,519,743.32	$105,267,209.79

Publicly Traded & Alternative Assets (70% Equity), Moving Average Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	4.51%	12.32%	8.38%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	2.34%	9.69%	5.90%
Annual Portfolio Return Standard Deviation	8.35%	13.49%	10.72%
Average Inflation-Adjusted Spending	$897,160.04	$2,312,962.58	$1,431,684.75
Minimum Inflation-Adjusted Spending	$610,646.73	$1,384,582.70	$1,056,579.89
Average Inflation-Adjusted Spending Drawdown	-32.79%	-0.54%	-7.70%
Maximum Inflation-Adjusted Spending Drawdown	-57.97%	-3.60%	-22.99%
Average Inflation-Adjusted Portfolio Value Drawdown	-39.03%	-4.49%	-14.14%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-66.69%	-15.96%	-35.43%
Inflation-Adjusted Terminal Value	$57,429,379.70	$374,496,455.50	$162,300,280.85

Publicly Traded & Alternative Assets (70% Equity), Banded Inflation Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	4.51%	12.32%	8.38%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	2.34%	9.69%	5.90%
Annual Portfolio Return Standard Deviation	8.35%	13.49%	10.72%
Average Inflation Adjusted Spending	$914,093.06	$2,244,062.31	$1,396,187.72
Minimum Inflation Adjusted Spending	$655,921.51	$1,345,406.35	$1,121,716.43
Average Inflation Adjusted Spending Drawdown	-25.71%	0.00%	-2.15%
Maximum Inflation Adjusted Spending Drawdown	-49.77%	0.00%	-6.94%
Average Inflation Adjusted Portfolio Value Drawdown	-39.80%	-4.09%	-13.68%
Maximum Inflation Adjusted Portfolio Value Drawdown	-68.12%	-14.56%	-34.93%
Inflation Adjusted Terminal Value	$56,032,403.32	$409,208,545.82	$172,374,731.71

Publicly Traded & Alternative Assets (70% Equity), Hybrid Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	4.51%	12.32%	8.38%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	2.34%	9.69%	5.90%
Annual Portfolio Return Standard Deviation	8.35%	13.49%	10.72%
Average Inflation-Adjusted Spending	$899,261.17	$2,295,819.72	$1,421,644.54
Minimum Inflation-Adjusted Spending	$617,519.29	$1,365,847.01	$1,073,292.17
Average Inflation-Adjusted Spending Drawdown	-31.12%	-0.21%	-5.95%
Maximum Inflation-Adjusted Spending Drawdown	-55.89%	-1.81%	-18.62%
Average Inflation-Adjusted Portfolio Value Drawdown	-39.88%	-4.37%	-14.12%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-67.64%	-15.40%	-35.47%
Inflation-Adjusted Terminal Value	$55,955,265.28	$389,996,380.03	$164,579,082.34

Detailed Publicly Traded & Alternative Assets (70% Equity), Moving Average Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	4.33%	12.32%	8.34%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	2.09%	9.22%	5.85%
Annual Portfolio Return Standard Deviation	8.51%	13.82%	10.89%
Average Inflation-Adjusted Spending	$917,918.69	$2,435,610.01	$1,420,819.88
Minimum Inflation-Adjusted Spending	$619,682.38	$1,354,208.25	$1,052,683.25
Average Inflation-Adjusted Spending Drawdown	-34.84%	-0.68%	-7.93%
Maximum Inflation-Adjusted Spending Drawdown	-59.11%	-4.17%	-23.37%
Average Inflation-Adjusted Portfolio Value Drawdown	-39.19%	-5.29%	-14.49%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-68.18%	-16.98%	-35.94%
Inflation-Adjusted Terminal Value	$58,736,926.13	$370,352,906.63	$159,906,374.58

Detailed Publicly Traded & Alternative Assets (70% Equity), Banded Inflation Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	4.33%	12.32%	8.34%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	2.09%	9.22%	5.85%
Annual Portfolio Return Standard Deviation	8.51%	13.82%	10.89%
Average Inflation-Adjusted Spending	$920,047.81	$2,452,757.65	$1,386,306.91
Minimum Inflation-Adjusted Spending	$646,457.86	$1,328,428.27	$1,119,614.83
Average Inflation-Adjusted Spending Drawdown	-27.93%	0.00%	-2.28%
Maximum Inflation-Adjusted Spending Drawdown	-51.22%	0.00%	-7.28%
Average Inflation-Adjusted Portfolio Value Drawdown	-42.07%	-4.95%	-14.04%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-69.58%	-15.98%	-35.46%
Inflation-Adjusted Terminal Value	$57,427,726.40	$401,216,703.24	$169,502,277.23

Detailed Publicly Traded & Alternative Assets (70% Equity), Hybrid Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	4.33%	12.32%	8.34%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	2.09%	9.22%	5.85%
Annual Portfolio Return Standard Deviation	8.51%	13.82%	10.89%
Average Inflation-Adjusted Spending	$913,497.50	$2,421,789.80	$1,411,008.32
Minimum Inflation-Adjusted Spending	$636,322.03	$1,368,469.18	$1,069,857.73
Average Inflation-Adjusted Spending Drawdown	-31.44%	-0.23%	-6.15%
Maximum Inflation-Adjusted Spending Drawdown	-56.22%	-2.04%	-19.01%
Average Inflation-Adjusted Portfolio Value Drawdown	-40.13%	-5.18%	-14.47%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-69.10%	-16.56%	-35.98%
Inflation-Adjusted Terminal Value	$57,269,140.54	$385,795,163.80	$162,032,324.96

Publicly Traded Assets Only (90% Equity), Moving Average Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	2.58%	12.77%	7.82%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	0.42%	9.92%	5.33%
Annual Portfolio Return Standard Deviation	12.44%	20.08%	16.03%
Average Inflation-Adjusted Spending	$757,378.42	$2,623,762.69	$1,322,991.36
Minimum Inflation-Adjusted Spending	$413,655.19	$1,319,619.94	$944,302.65
Average Inflation-Adjusted Spending Drawdown	-48.77%	-1.07%	-14.23%
Maximum Inflation-Adjusted Spending Drawdown	-73.75%	-5.94%	-34.72%
Average Inflation-Adjusted Portfolio Value Drawdown	-56.21%	-8.49%	-23.53%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-80.64%	-25.71%	-49.95%
Inflation-Adjusted Terminal Value	$31,012,592.78	$423,127,553.35	$138,217,151.92

Publicly Traded Assets Only (90% Equity), Banded Inflation Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	2.58%	12.77%	7.82%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	0.42%	9.92%	5.33%
Annual Portfolio Return Standard Deviation	12.44%	20.08%	16.03%
Average Inflation-Adjusted Spending	$780,740.91	$2,712,787.54	$1,300,700.45
Minimum Inflation-Adjusted Spending	$426,243.13	$1,357,263.51	$1,022,716.88
Average Inflation-Adjusted Spending Drawdown	-42.13%	0.00%	-7.64%
Maximum Inflation-Adjusted Spending Drawdown	-68.47%	0.00%	-20.28%
Average Inflation-Adjusted Portfolio Value Drawdown	-58.06%	-8.11%	-23.41%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-81.56%	-24.65%	-49.97%
Inflation-Adjusted Terminal Value	$29,342,211.80	$451,042,162.14	$142,289,034.35

Publicly Traded Assets Only (90% Equity), Hybrid Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	2.58%	12.77%	7.82%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	0.42%	9.92%	5.33%
Annual Portfolio Return Standard Deviation	12.44%	20.08%	16.03%
Average Inflation-Adjusted Spending	$761,715.22	$2,628,758.10	$1,313,801.89
Minimum Inflation-Adjusted Spending	$419,394.94	$1,356,935.16	$971,070.17
Average Inflation-Adjusted Spending Drawdown	-44.56%	-0.35%	-11.85%
Maximum Inflation-Adjusted Spending Drawdown	-72.64%	-2.86%	-29.86%
Average Inflation-Adjusted Portfolio Value Drawdown	-57.13%	-8.40%	-23.71%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-81.59%	-24.79%	-50.22%
Inflation-Adjusted Terminal Value	$29,691,316.07	$440,341,354.86	$138,643,688.46

Publicly Traded & Alternative Assets (90% Equity), Moving Average Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	4.45%	13.81%	9.12%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	2.28%	11.31%	6.63%
Annual Portfolio Return Standard Deviation	10.27%	16.71%	13.27%
Average Inflation-Adjusted Spending	$921,345.07	$3,114,184.46	$1,645,161.99
Minimum Inflation-Adjusted Spending	$614,199.37	$1,473,098.43	$1,082,203.77
Average Inflation-Adjusted Spending Drawdown	-34.81%	-0.31%	-7.47%
Maximum Inflation-Adjusted Spending Drawdown	-63.18%	-3.37%	-24.55%
Average Inflation-Adjusted Portfolio Value Drawdown	-41.38%	-4.95%	-15.27%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-72.63%	-17.23%	-39.70%
Inflation-Adjusted Terminal Value	$56,530,777.03	$577,526,679.34	$208,482,433.60

Publicly Traded & Alternative Assets (90% Equity), Banded Inflation Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	4.45%	13.81%	9.12%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	2.28%	11.31%	6.63%
Annual Portfolio Return Standard Deviation	10.27%	16.71%	13.27%
Average Inflation-Adjusted Spending	$926,172.30	$3,029,549.93	$1,603,222.91
Minimum Inflation-Adjusted Spending	$650,151.61	$1,417,606.95	$1,133,704.02
Average Inflation-Adjusted Spending Drawdown	-26.54%	0.00%	-2.22%
Maximum Inflation-Adjusted Spending Drawdown	-55.96%	0.00%	-8.26%
Average Inflation-Adjusted Portfolio Value Drawdown	-42.14%	-4.56%	-14.80%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-73.79%	-17.07%	-39.21%
Inflation-Adjusted Terminal Value	$57,182,082.15	$633,538,666.85	$223,728,391.11

Publicly Traded & Alternative Assets (90% Equity), Hybrid Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	4.45%	13.81%	9.12%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	2.28%	11.31%	6.63%
Annual Portfolio Return Standard Deviation	10.27%	16.71%	13.27%
Average Inflation-Adjusted Spending	$922,524.61	$3,077,753.23	$1,629,177.66
Minimum Inflation-Adjusted Spending	$631,138.98	$1,457,655.31	$1,097,185.04
Average Inflation-Adjusted Spending Drawdown	-32.07%	-0.12%	-5.55%
Maximum Inflation-Adjusted Spending Drawdown	-59.72%	-1.45%	-19.39%
Average Inflation-Adjusted Portfolio Value Drawdown	-42.29%	-4.80%	-15.20%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-73.52%	-17.20%	-39.67%
Inflation-Adjusted Terminal Value	$55,687,694.43	$608,496,065.53	$213,260,200.14

Detailed Publicly Traded & Alternative Assets (90% Equity), Moving Average Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	4.56%	13.58%	9.08%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	2.16%	10.64%	6.59%
Annual Portfolio Return Standard Deviation	10.28%	16.71%	13.15%
Average Inflation-Adjusted Spending	$961,648.81	$3,210,275.34	$1,630,512.50
Minimum Inflation-Adjusted Spending	$615,153.38	$1,421,170.07	$1,082,444.74
Average Inflation-Adjusted Spending Drawdown	-32.42%	-0.48%	-7.39%
Maximum Inflation-Adjusted Spending Drawdown	-63.36%	-3.48%	-24.27%
Average Inflation-Adjusted Portfolio Value Drawdown	-41.49%	-5.54%	-15.11%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-73.08%	-19.54%	-39.30%
Inflation-Adjusted Terminal Value	$61,457,827.05	$571,825,520.32	$205,163,274.13

Detailed Publicly Traded & Alternative Assets (90% Equity), Banded Inflation Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	4.56%	13.58%	9.08%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	2.16%	10.64%	6.59%
Annual Portfolio Return Standard Deviation	10.28%	16.71%	13.15%
Average Inflation-Adjusted Spending	$956,404.35	$3,308,710.76	$1,588,750.24
Minimum Inflation-Adjusted Spending	$646,864.68	$1,403,908.98	$1,134,765.03
Average Inflation-Adjusted Spending Drawdown	-27.27%	0.00%	-2.12%
Maximum Inflation-Adjusted Spending Drawdown	-56.24%	0.00%	-7.95%
Average Inflation-Adjusted Portfolio Value Drawdown	-42.34%	-5.12%	-14.63%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-74.25%	-18.95%	-38.80%
Inflation-Adjusted Terminal Value	$60,507,628.00	$623,678,070.76	$220,152,270.45

Detailed Publicly Traded & Alternative Assets (90% Equity), Hybrid Spending

	Minimum	Maximum	Average
Average Annual Portfolio Return	4.56%	13.58%	9.08%
Average Annual Inflation	0.98%	4.08%	2.49%
Average Annual Real Return	2.16%	10.64%	6.59%
Annual Portfolio Return Standard Deviation	10.28%	16.71%	13.15%
Average Inflation-Adjusted Spending	$952,956.57	$3,215,940.59	$1,614,960.42
Minimum Inflation-Adjusted Spending	$639,442.74	$1,437,164.75	$1,097,300.93
Average Inflation-Adjusted Spending Drawdown	-29.38%	-0.11%	-5.48%
Maximum Inflation-Adjusted Spending Drawdown	-60.00%	-1.56%	-19.17%
Average Inflation-Adjusted Portfolio Value Drawdown	-42.53%	-5.40%	-15.04%
Maximum Inflation-Adjusted Portfolio Value Drawdown	-73.92%	-19.39%	-39.27%
Inflation-Adjusted Terminal Value	$60,021,735.84	$604,052,074.07	$209,750,259.05

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