Managing a Trust Fund: Formal Report

Executive Summary

This report dives into and evaluates the long-term investment strategies for a trust aiming to support an annual spending cost, while keeping purchasing power over 30-years. Various portfolio allocations and spending rates were analyzed through simulations, focusing on real returns, downside risk, and capital sustainability.

The **traditional 60/40 portfolio** showed strong performance, with a 1.69% real return and a 92.52% increase in purchasing power, but a modest 18.1% risk of capital erosion. A **modified 60/35/5 portfolio**, which adds a 5% money market position, produced nearly identical long-term results, while enhancing liquidity and short-term stability.

Raising the **spending rate to 3.5%** increases the probability of loss to 28.1%, but still supports meaningful real growth, with average purchasing power rising by 66.23%. In contrast, a **4.0% rate** results in over one-third of scenarios failing to preserve capital and is not recommended.

Recommendation

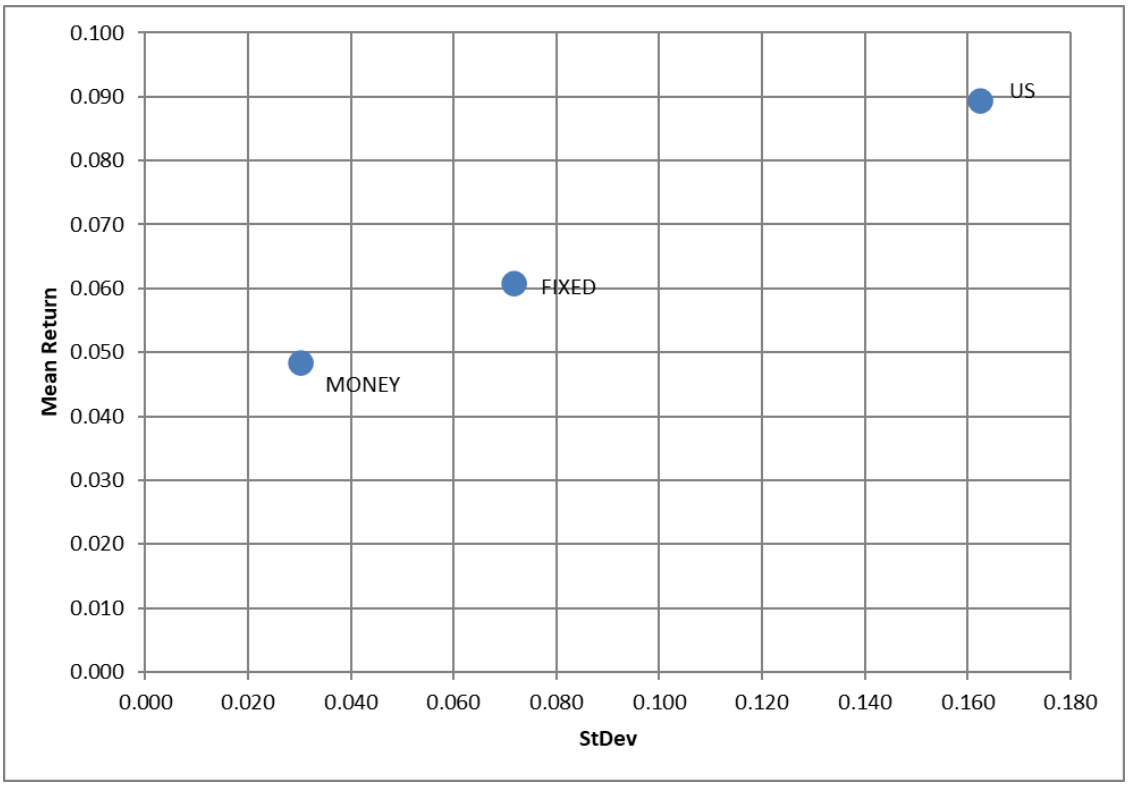
A 60% US / 35% Fixed Income / 5% Money Market allocation paired with a 3.5% spending rate strikes the best balance between growth, sustainability, and flexibility. It aligns well with the trust's objectives, assuming moderate risk tolerance and regular performance review.

Exploring Historical Asset Performance

Taking a look at the fund we have, we want to understand the types of investments involved and the market we are entering. To select the appropriate investments, we need to break down the different markets. Our goal is to choose a balanced allocation among the money market (MONEY), blended fixed income fund (FIXED), and US large-cap equities (US). The blended fixed income fund consists of 65% intermediate-term government bonds and 35% long-term corporate bonds.

By analyzing the historical data of each of these markets, we can observe how they vary.

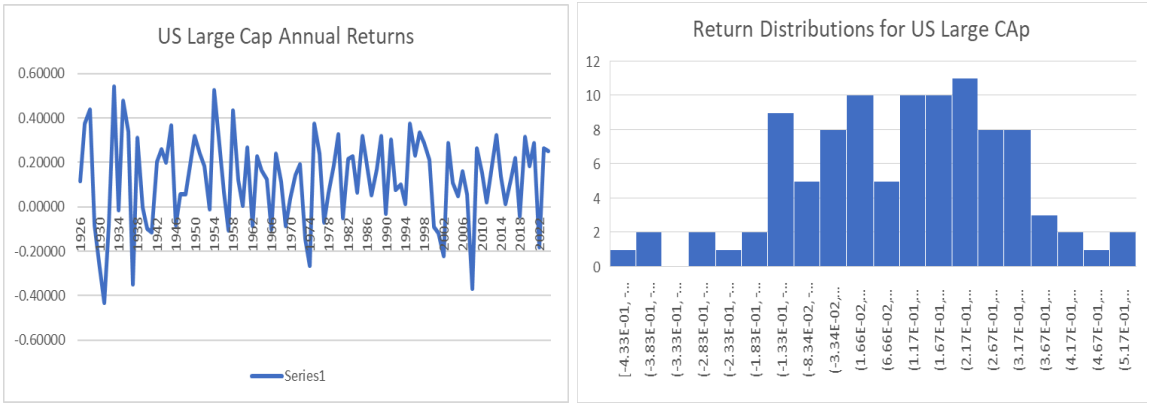
Figure 1: Risk vs Return (1926-2023): Historical Asset Class Performance



From Figure 1 above, we can see that the US market has significantly higher returns compared to the MONEY and FIXED markets. However, it also comes with a much higher standard deviation, which represents risk or volatility. Our objective is to build a balanced investment strategy that maximizes profits while avoiding risk. We must examine each of these markets in further detail in order to see why returns and volatility differ throughout them.

Starting with the return distribution for US large-cap equities, we can see how much the returns vary.

Figure 2: US Large-Cap Equities: Annual Returns and Return Distribution

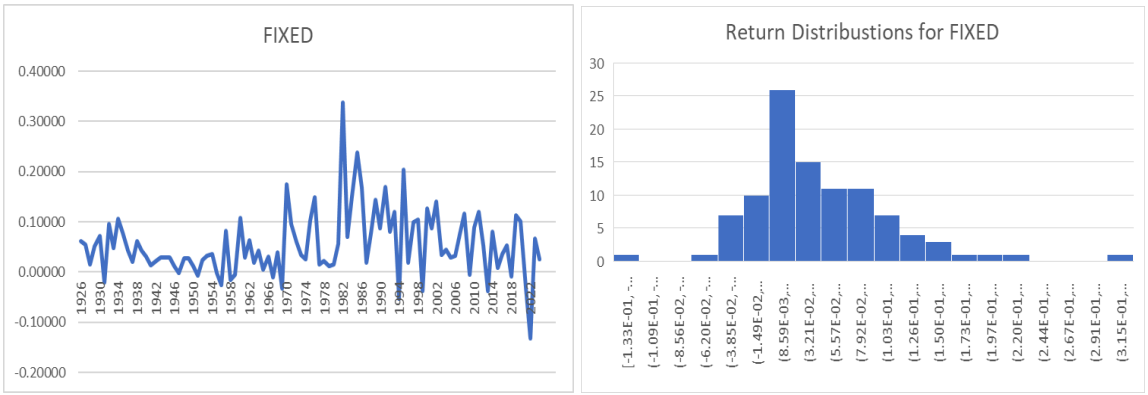


The line graph above shows a high degree of variability, with many peaks as well as significant dips into negative returns. This explains why US market returns are high, but also highlights the inherent risk of this market.

This is further illustrated by the return distribution, which lacks sharp peaks in its curve, indicating high variability in returns and, consequently, a high standard deviation. Additionally, 8 of the 20 binned return categories fall into the negative range, reinforcing the high level of risk associated with the US market.

In contrast, when we examine the FIXED market, we see a different story.

Figure 3: FIXED Market Equities: Annual Returns and Return Distribution



Through the line plot, we observe that the majority of returns in the FIXED market are positive. However, the line does not reach the same highs as the US market, reflecting its lower overall returns. When examining the return distribution, we see that most returns are indeed positive, but there is a pronounced peak at the lowest positive return value, indicating a concentration of modest gains.

Historical Performance

Since the traditional investment approach for our trust has to be using a 60/40 investment approach wherein 60% of the funds are invested in US large cap equities and 40% of the funds are invested in a blended fixed income fund, we have to look at the numbers of our 60/40 fund.

Figure 4: Summary Statistics of Asset Class Performance

Asset Class	Average Return	Standard Deviation	Minimum Return	Maximum Return
US	12.29%	19.67%	-43.34%	53.99%
INT GOV	5.01%	5.66%	-9.36%	29.10%
LT CORP	6.09%	8.81%	-20.52%	42.56%
FIXED	5.39%	6.50%	-13.26%	33.81%
60/40	9.53%	12.33%	-26.86%	34.322%

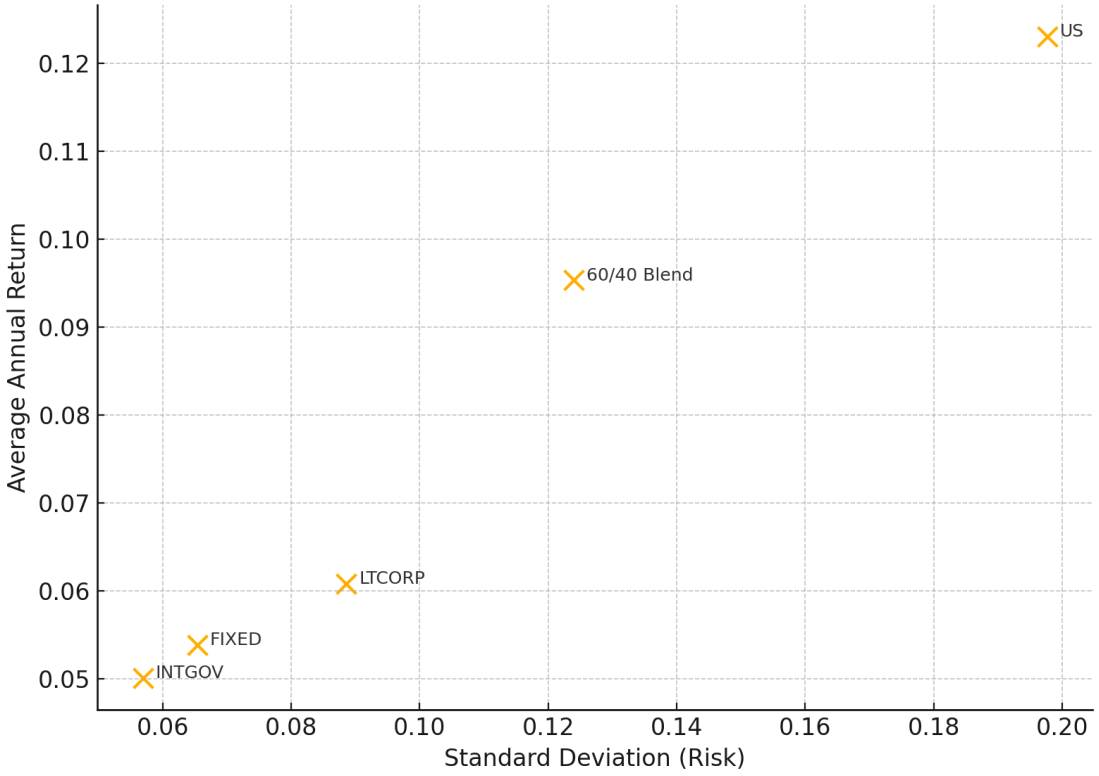
U.S. Large Cap Stocks (US) exhibited the highest average return at 12.29%, but also the highest volatility, with a standard deviation of nearly 20%. This shows the risk to return trade-off within equities. The greater the return potential, the higher the downside risk, as seen in a minimum return of -43.34%.

Fixed income instruments, including Intermediate Government Bonds (INTGOV) and Long-Term Corporate Bonds (LTCORP), delivered lower returns of 5.01% and 6.09%, respectively. While these assets deliver significantly lower returns, they offer greater stability.

The 60/40 Blend, a traditional diversified portfolio consisting of 60% equities and 40% bonds, demonstrated a balanced performance profile. It achieves an average return of 9.53% with a standard deviation of 12.33%. This allocation allows the pros of each portfolio, making it an attractive strategy for long-term investors.

FIXED, a synthetic fixed income blend used in the model, also showed relatively stable performance, with an average return of 5.39% and volatility of 6.50%, putting it in between.

Figure 5: Risk vs Return (1926-2023): Historical Selected Asset Class Performance

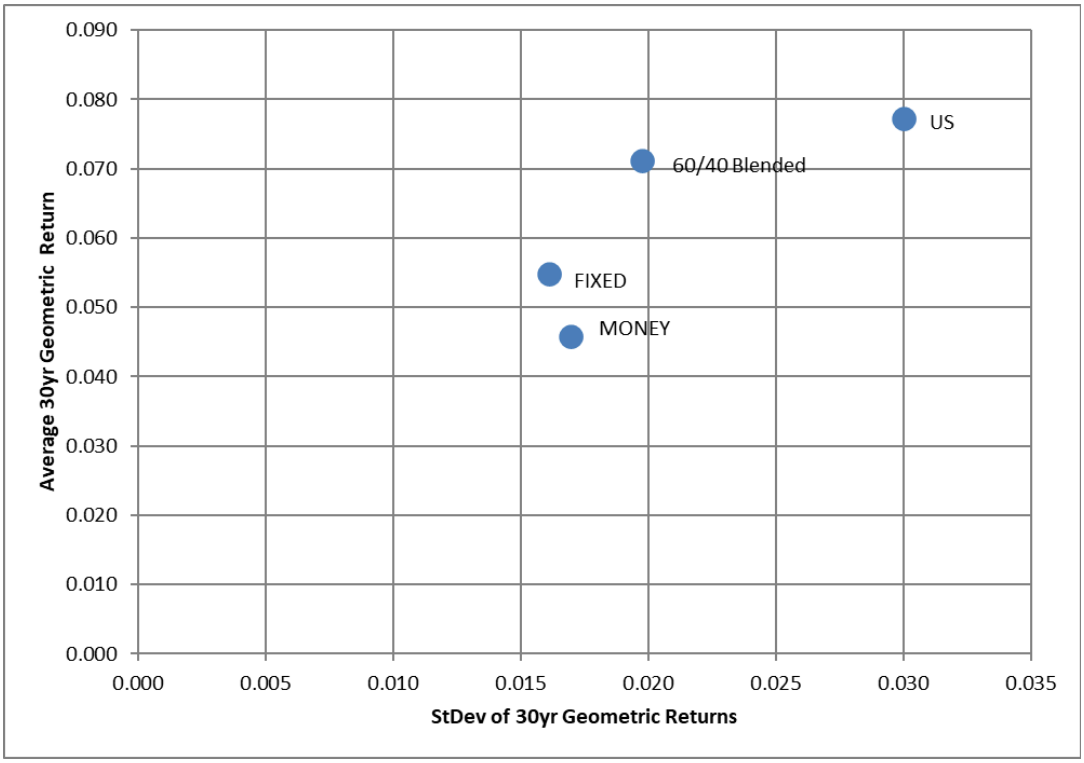


This chart illustrates how the 60/40 Blend strikes a middle ground between average annual return and standard deviation, positioning itself between the more conservative fixed income market and the higher-risk, higher-return US equity market.

Evaluating Long-Term Risk and Return: The Case for 60/40 Allocation

Since our goal is to determine how to invest the portfolio over the next 30-year investment horizon, we need to evaluate how returns evolve over that period. Fortunately, my assistant, Ronny Destin, has prepared a simulation that we can use for this purpose.

Figure 6: Risk-Return Profile of Asset Classes and 60/40 Portfolio (30-Year Horizon)



As shown in Figure 6, the trade-off between risk and return is illustrated as with higher returns, brings in higher standard deviation.

Key observations:

- **US Equities** provide the highest long-term return (~7.8%) but also exhibit the highest volatility (~3.0% standard deviation).
- **Money Market** (MONEY) is the least volatile (~1.6%) but offers the lowest return (~4.5%), which is near or below the inflation rate, making it a poor choice for preserving purchasing power over the long term.
- **Blended Fixed Income** (FIXED) delivers moderate returns with relatively low risk, offering a conservative alternative.
- The **60/40 Blended Portfolio** achieves a favorable balance, offering higher returns than FIXED and MONEY, while significantly reducing volatility compared to a 100% equity allocation.

Looking at historical performance, the 60/40 portfolio delivered a strong long-term average return of approximately 8.6% from 1926 to 2023. When compared to US

equities alone, the standard deviation drops from 19.7% to 11%, a substantial reduction of 8.7 percentage points, or roughly 44%.

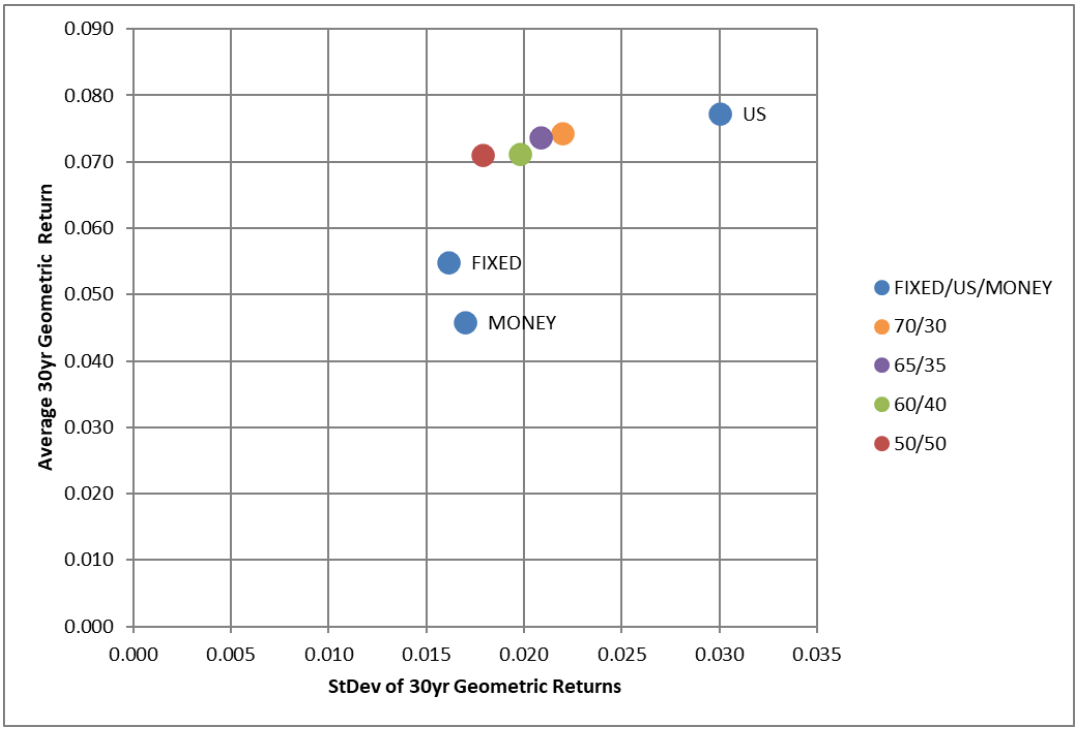
However, these benefits come with trade-offs. The diversification that reduces risk can also dilute returns during periods of strong equity performance. For example, during equity booms such as 1949–1959, having 40% allocated to the lower-return fixed income market may limit potential gains. This becomes a concern when fixed income returns are too low to offset spending needs and inflation, potentially undermining long-term purchasing power.

Exploring Alternative Allocations

Using the traditional 60/40 strategy, has provided a balanced mix of growth and stability, we can still explore other options to see where the line between higher returns and volatility lie.

Increasing equity exposure (e.g., 70/30 or 65/35) boosts long-term growth potential but raises short-term volatility, suitable for trusts with higher risk tolerance. Reducing equity (e.g., 50/50) lowers risk and may better support near-term spending. We have ran the simulation and plotted the returns and standard deviation over 30 years.

Figure 7: Risk-Return Tradeoffs for Alternative Portfolio Allocations (30-Year Horizon)

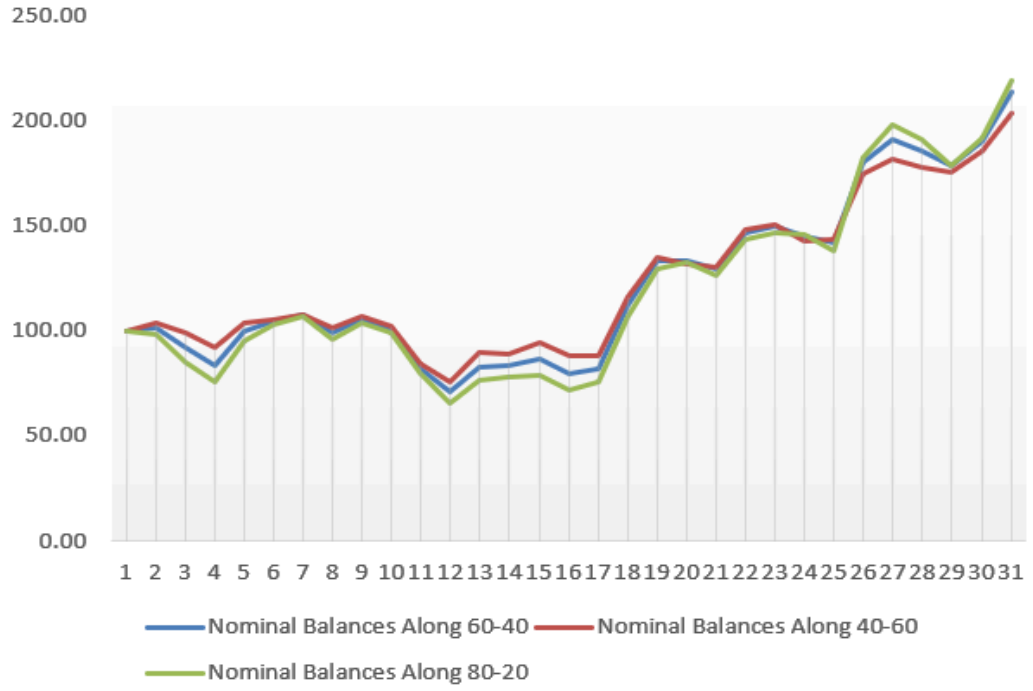


In figure 7 above, we compare several constant-mix portfolios based on their 30-year geometric average return (y-axis) and volatility, measured by the standard deviation of return (x-axis).

If we were to increase equity exposure to a 70/30 allocation, the portfolio would return at a higher amount, however this would create greater volatility. This would be able to access higher average returns over time. Conversely, reducing equity exposure to a 50/50 allocation lowers both return and volatility.

To gain a better understanding of how these allocations perform over time, I have plotted the nominal portfolio balances for three scenarios: 80/20, 60/40, and 40/60. While the 80/20 and 40/60 allocations are not under active consideration, they serve to illustrate the extremes in the equity allocation, helping to visualize the impact of shifts in asset allocation.

Figure 8: Nominal Balance Under Different Percentages



When plotting the nominal balance over a 30-year horizon, a clear pattern emerges. The more conservative 40/60 portfolio remains closer to the mean line, with times of negative returns having less impact, but ultimately ends with lower returns. In contrast, the more aggressive 80/20 portfolio deviates further from the mean, showing greater sensitivity to poor market performance, particularly in years 11 through 18, where it experiences a significant dip. However, by the end of the period, it achieves the highest overall returns.

Money Market inclusion

So far, our focus has been on blending the US equity market with the FIXED income market. However we also have the option of, incorporating the Money Market. Before we haven't incorporated it due to its historically low returns. We should still explore the strategical benefits to to enhance portfolio stability and liquidity.

The scenario we want to consider is a 60% US Equities / 35% Fixed Income / 5% Money Market allocation. First we need to compare it with the 60/40.

Figure 9: Performance Summary for 60% US Equities / 40% Fixed Income Allocation

Prob Loss PP	18.10%			
E[% Loss PP | Loss PP]	-25.58%			
	Balance	Real Balance	%change pp	Real Return GEO
Min	54.54	26.00	-74.00%	-0.0439
Max	1905.90	908.63	808.63%	0.0763
Average	403.82	192.52	92.52%	0.0169
xi_05	136.66	65.15	-34.85%	-0.0142
xi_01	89.30	42.57	-57.43%	-0.0281

Based on figure 9, it shows strong long-term performance. The average real return is 1.69%, with the portfolio more than doubling in real terms (+92.52%), supporting sustained trust spending. There is an 18.1% chance of ending with less purchasing power, with an average shortfall of -25.58% in those cases. The worst-case scenario results in a 74% loss, while the best-case shows an 808.63% gain, with a 7.63% annualized return.

It offers strong upside potential and moderate downside protection. While the higher fixed income allocation slightly improves capital preservation, it does not eliminate risk in extreme scenarios.

Figure 10: Performance Summary for 60% US Equities / 35% Fixed Income / 5% Money Market Allocation

Prob Loss PP	18.50%			
E[% Loss PP | Loss PP]	-25.16%			
	Balance	Real Balance	%change pp	Real Return GEO
Min	54.52	25.99	-74.01%	-0.0439
Max	1892.91	902.43	802.43%	0.0761
Average	402.50	191.89	91.89%	0.0168
xi_05	136.53	65.09	-34.91%	-0.0142
xi_01	89.04	42.45	-57.55%	-0.0282

This allocation modestly adjusts the traditional 60/40 portfolio by introducing a 5% position in Money Market assets, reducing fixed income exposure to 35%. Over a 30-year horizon, the simulation shows an average real return of 1.67%, slightly below the 60/40's 1.69%, but still above the inflation-adjusted spending target. On average, the portfolio more than doubles in real terms (+91.89%), similar to the 60/40's 92.52%. However, downside risk remains a concern, with an 18.5% probability of losing purchasing power and an average shortfall of -25.16% in those cases. The worst-case outcome results in a 57.55% loss, while the best case shows an 802% gain with a 7.61% annualized real return.

The inclusion of a 5% Money Market position enhances liquidity and provides an added layer of short-term stability, helping to buffer against interest rate fluctuations and short-term market stress.

Spending Rate

The trust's primary objective is to maximize the spending rate without eroding purchasing power over 30 years. We will evaluate each spending scenario based on real return, probability of loss in purchasing power, and downside risk. We will be looking at the long term performance of the 60/35/5 portfolio.

Figure 11: Long-Term Portfolio Performance and Risk at a 3.0% Spending Rate

Spending Rate	0.0300			
Inflation Rate	0.0250			
Prob Loss PP	18.50%			
E[% Loss PP | Loss PP]	-25.16%			
	Balance	Real Balance	%change pp	Real Return GEO
Min	54.52	25.99	-74.01%	-0.0439
Max	1892.91	902.43	802.43%	0.0761
Average	402.50	191.89	91.89%	0.0168
xi_05	136.53	65.09	-34.91%	-0.0142
xi_01	89.04	42.45	-57.55%	-0.0282

When plotting the results while accounting for a spending rate of 3.0%, the portfolio demonstrates a real geometric return of 1.68% and an average real balance of 191.89, representing a 91.89% increase over 30 years. The probability of losing purchasing power is 18.5%, with an average shortfall of -25.16% in those downside cases.

Figure 12: Long-Term Portfolio Performance and Risk at a 3.5% Spending Rate

Spending Rate	0.0350			
Inflation Rate	0.0250			
Prob Loss PP	28.10%			
E[% Loss PP | Loss PP]	-25.79%			
	Balance	Real Balance	%change pp	Real Return GEO
Min	46.72	22.27	-77.73%	-0.0488
Max	1650.48	786.85	686.85%	0.0712
Average	348.69	166.23	66.23%	0.0119
xi_05	117.53	56.03	-43.97%	-0.0191
xi_01	76.49	36.47	-63.53%	-0.0331

Raising the spending rate to 3.5% reduces the real geometric return to 1.19%, and average real balance declines to 166.23—an increase of 66.23% over 30 years. However, the probability of losing purchasing power rises significantly to 28.1%, and the average shortfall in those cases worsens slightly to -25.79%.

Compared to the 3.0% scenario, the 3.5% spending rate introduces a substantially higher risk of capital erosion. The likelihood of ending with less purchasing power increases by nearly 10 percentage points, and although the average shortfall remains similar, the overall sustainability of the portfolio is weakened.

Figure 13: Long-Term Portfolio Performance and Risk at a 4.0% Spending Rate

Spending Rate	0.0400			
Inflation Rate	0.0250			
Prob Loss PP	36.40%			
E[% Loss PP | Loss PP]	-29.28%			
	Balance	Real Balance	%change pp	Real Return GEC
Min	40.01	19.07	-80.93%	-0.0537
Max	1438.18	685.64	585.64%	0.0663
Average	301.86	143.91	43.91%	0.0070
xi_05	101.10	48.20	-51.80%	-0.0240
xi_01	65.66	31.30	-68.70%	-0.0380

At a 4.0% spending rate, the portfolio's real geometric return declines to 0.70%, and the average real balance drops to 143.91—reflecting a 43.91% increase over 30 years. However, the probability of losing purchasing power rises sharply to 36.4%, and the average shortfall in those downside cases deepens to -29.28%.

Compared to the 3.0% and 3.5% scenarios, the 4.0% spending rate significantly increases risk. The probability of failing to preserve purchasing power rises from 18.5% at 3.0% and 28.1% at 3.5% to 36.4%, meaning more than one in three

outcomes result in capital erosion. Having the spending rate be so high and dangerously close to the long-term inflation rate, it significantly reduces the margin of error error, and can lead to long term losses. Therefore, a 4.0% spending rate is not recommended for a trust focused on long-term purchasing power preservation.

The 3.5% rate stands out as a practical and effective middle ground. It offers higher distributions than the more conservative 3.0% rate while maintaining acceptable downside risk.

Recommendation

After evaluating a range of portfolio allocations and spending strategies over a 30-year horizon, the analysis supports a 60% US equities / 35% fixed income / 5% money market allocation paired with a 3.5% annual spending rate as a balanced and sustainable approach for the trust. This strategy offers a compelling mix of long-term growth potential, moderate downside risk, and improved liquidity.

While the traditional 60/40 portfolio remains slightly more efficient in terms of raw return and risk metrics, the 60/35/5 allocation introduces added flexibility without materially sacrificing performance. The 3.5% spending rate provides meaningful annual distributions while maintaining a high probability of preserving purchasing power, assuming prudent management and periodic review.

Given the trust's objectives, to support ongoing obligations while preserving real value over time, the recommended strategy aligns well with both financial goals and risk tolerance. Regular monitoring and adaptive spending policies may further strengthen long-term sustainability.