

It is largely an accident of history that more organizations do not face the risk of losing some or all endowment support from market value declines. This risk is real, however, as losses can easily threaten the historic dollar value of newly established funds.

## Quantifying Risk Tolerance, Part II

IN THE FIRST PART OF THIS SERIES on quantifying risk tolerance (available in the last issue or at [www.aametrics.com](http://www.aametrics.com)), we explained how an organization's tolerance for variable endowment returns is essentially a function of three factors: first, how much budget support is provided by the endowment; second, how much discretionary spending is included in the budget (net of endowed programs); and third, how much accumulated income above and beyond original gift principal is in the endowment. Organizations that rely heavily on endowment support to meet their annual operating budget, or with little discretionary spending in their budgets, or with small amounts of accumulated income in their endowments will have a low tolerance for variable endowment returns. In these cases, a drop in the value of the endowment may force reductions in critical operations and threaten the long-run stability of the organization.

A quick and simple example will serve to illustrate. Suppose an organization has a \$10 million endowment and a \$5 million operating budget. Further suppose that the organization has drawn 5% from the endowment annually for operating budget support. For the time being, we will overlook the question of balance averaging. At a 5% spending rate, the \$10 million budget will provide \$500,000 towards the \$5,000,000 annual operating budget or 10% of the budget.

To determine this organization's endowment risk tolerance, we need to know some additional information. First, we need to know how much of the annual operating budget is discretionary. How much can the budget be reduced without affecting vital services or organizational infrastructure? Second, we need to know how much of the \$500,000 in annual budget support from the endowment is narrowly restricted as to purpose and how much has few or no restrictions attached to it. Third, we need to know how the endowment breaks down between narrowly restricted funds, broadly restricted funds, and unrestricted funds, and how much accumulated income is in each category above and beyond original gift principal.

For the sake of illustration, suppose that the \$5,000,000 operating budget has \$50,000 of discretionary expenses. These expenses might include the cost of conferences, staff training and development, public relations expenditures and other important but not urgent expense programs. Suppose further, however, the endowment has a specific fund to support staff training and development and that this fund will provide \$20,000 of budget support under the endowment spending formula. In other words, of the \$500,000 in annual budget support from the endowment, \$20,000 is earmarked for staff training in fulfillment of the restrictions on one constituent fund of the endowment.

The net discretionary budget of our hypothetical organization, therefore, is \$30,000 (\$50,000 less the \$20,000 in support coming automatically from the specific fund supporting the discretionary expense). Before we consider the composition of the endowment itself, we can see that this organization does not have a wide tolerance for variable endowment returns. Net discretionary spending is equal to only six percent of the annual support from the endowment (\$30,000 of \$500,000). All other things being the same, a drop of more than six percent in the endowment balance will reduce the annual budget support from the endowment by more than can be made up for by reductions in discretionary spending. If the endowment balance drops by eight percent from \$10 million to \$9.2 million, annual budget support will drop \$40,000 from \$500,000 to \$460,000. This reduction in budget support will reduce the amount earmarked for staff training from \$20,000 to \$18,400. Discretionary expenses net of endowed support are now \$31,600 (\$50,000 less \$18,400). But even if the organization eliminates all discretionary spending, it cannot make up the \$40,000 shortfall in total endowment support.

We must consider the composition of the endowment itself to complete the risk assessment. If the organization is an old one with a long-established endowment and a history of prudent spending, it is likely that a large volume of gains has accumulated over time, leaving the various funds within the endowment with balances well in excess of original gift principal.

If this is the case, the endowment can suffer substantial declines in value before endowment withdrawals for budget support run the risk of tapping into original gift amounts which may not be spent.

However, if the organization's endowment is newer or if it has spent heavily from its endowment, the accumulated earnings in excess of original gift amounts may be smaller relative to the total endowment, and the organization will face another risk factor besides the one posed by operating budget flexibility or inflexibility.

In our hypothetical case, if we imagine the endowment is newer and has accumulated earnings in excess of original gift amounts of only 15% of the total endowment balance (\$750,000 of the \$5,000,000 total), a loss of 15% of the endowment balance puts the organization in the catastrophic position of losing all endowment support because no funds would be available to draw on without violating the original gifts.\*

It is largely an accident of history that organizations with several decades of history do not often face this situation; but as endowments grow with new gifts and new constituent funds, they will face this situation with increasing frequency. The accident of history is the fact that endowments were managed for years under standards that permitted only interest and dividend income to be spent. Capital appreciation or gains could not be tapped. As a consequence, when total return principles of investment management were incorporated into the Uniform Management of Institutional Funds Act (UMIFA) in 1972 and organizations were explicitly permitted to spend capital appreciation above the historic dollar value of endowment gifts, some funds had a bank of appreciation that effectively insulated them from concerns about the effect of variable returns on the availability of funds to be spent for budget support. Newly established funds, however, do not have the luxury of a bank of appreciation. Those established in 2000 or 2001, in fact, may have experienced little or no gain in value above the original gift amount.

Although the Uniform Prudent Management of Institutional Funds Act (UPMIFA) of 2006 removes the strict requirement that the historic dollar value of endowment gifts be preserved, it has only been adopted by six states. It is currently under consideration by eleven additional states, the District of Columbia, and the Virgin Islands. Although the act provides greater leeway for organizations in dealing with expenditures from endowment funds whose value has fallen below historic gift value (so-called "underwater funds"), the commentary makes clear that the act does not make endowment funds unrestricted.

Returning to our hypothetical case, our organization is faced with two risk constraints: an operating budget constraint and an endowment composition constraint. A drop in endowment balances of more than six percent will force reductions in essential expenses, a drop of more than fifteen percent will curtail all endowment support of the budget.

## MANAGING VARIABLE RETURNS

Endowment managers and trustees have three options for managing variable endowment returns and the attendant risk of loss of value and operating support. First, the variability of returns can be reduced by managing the endowment's asset allocation to reduce overall portfolio risk and/or by purchasing portfolio insurance to reduce downside risk. Second, the impact of variable returns can be ameliorated by using spending formulas that smooth out returns and reduce the impact of declines in endowment balances during bear markets. Third, organizations can use a combination of portfolio risk reduction and spending policy formulation to manage the variability of returns.

\*The situation is likely to be more complicated than this simplified example. An organization will not lose all endowment support at once, but in stages, depending on how much accumulated earnings are available on the various subcategories that comprise its endowment. As a consequence, an organization is likely to lose some portion of its endowment support with an endowment balance decline of less than the percentage of overall accumulated earnings to the total. See the article in the last issue for further information.



Of the three options, the third is best. Using a spending formula to smooth out returns can allow an organization to achieve higher endowment returns through a more aggressive asset allocation without having to suffer the full effect of the more variable returns resulting from a higher risk exposure. With the right spending formula, an organization with a low risk tolerance does not have to rely on a low-risk, low-return asset allocation that will threaten long-term viability in order to manage the variability of endowment returns. The right spending formula, therefore, helps manage both short-term and long-term risks: the risk that variable returns will adversely impact budget support and mission, and the risk that low returns will erode the purchasing power of an endowment.

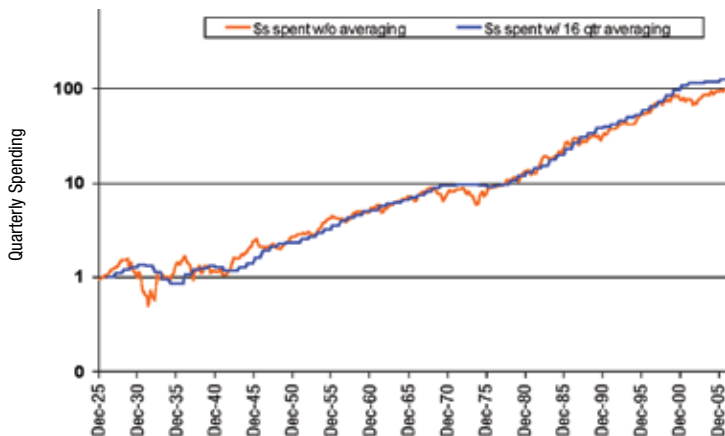
Here are important lessons for endowment and foundation trustees. Long-term and short-term risk can be managed simultaneously. Low-risk asset allocations that jeopardize the purchasing power of an endowment are not the only way to deal with variable endowment returns that can threaten the operational stability and continuity of an organization.

Traditional spending formulas, however, are not entirely sufficient to deal with the uncertainty of future returns, nor do they provide any protection in situations where an organization has a small margin of accumulated earnings above the historic gift value. Some portfolio risk reduction through asset allocation and/or portfolio insurance is necessary, as we shall see.

How effective are traditional average balance formulas at insulating budgets from shortfalls due to variable returns? Figure R.1 compares the spending that would have been produced by an historical portfolio of 65% U.S. equities and 35% U.S. bonds rebalanced annually and with a 4% spending policy. Without balance averaging, endowment support would have taken frequent dips. Budget support would have decreased in nineteen (19) of the years from 1927 to 2006. Using a sixteen-quarter trailing average balance (recalculated annually) to determine budget support from the endowment eliminates some of the decreases due to variable endowment balances. Endowment support would have declined in ten years from 1927 to 2006. The table in figure R.3 shows the ten years with decreases. They are grouped in three clusters: from 1932 to 1935, 1941 to 1943, and 1974 to 1976. The decreases during the Great Depression years would have been difficult and painful to absorb. Endowment spending would have suffered a 35% decline, presuming that balances would have been sufficient to support spending. The decreases in the early 40s and mid 70s would have been more modest, but still difficult. Note that the 2000-2002 bear market would not have resulted in any drop in budget support under this formula.

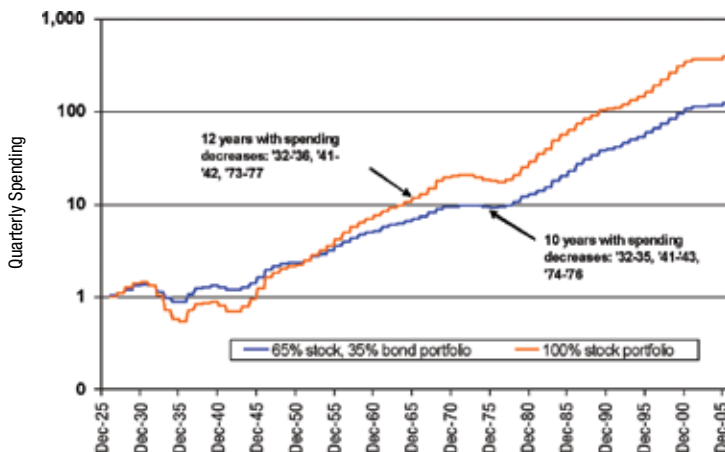
Figure R.2 compares the results for the 65% stock/35% bond portfolio with the spending that would have been produced by a 100% U.S. equity portfolio split 50/50 between large-cap and small-cap stocks (rebalanced annually) and also using a trailing sixteen-quarter average balance (recalculated annually). The average balance formula is not as effective at smoothing the results with the more volatile all-equity

**HYPOTHETICAL ENDOWMENT SPENDING FROM A 65% STOCK/ 35% BOND PORTFOLIO, WITH AND WITHOUT BALANCE AVERAGING**



**Figure R.1:** Comparison of Quarterly Spending from a Hypothetical Endowment Portfolio with and without Balance Averaging  
 Source: Advisor calculations

**HYPOTHETICAL ENDOWMENT SPENDING FROM A 65% STOCK/35% BOND PORTFOLIO VERSUS 100% STOCK PORTFOLIO, (4% spending on 16-quarter average balance recalculated annually)**



**Figure R.2:** Comparison of Spending from Hypothetical Endowment Portfolios, All Equity versus Stock/Bond Portfolio  
 Source: Advisor calculations

**COMPARISON OF YEARS WITH DECREASES IN BUDGET SUPPORT FROM ENDOWMENT SPENDING (using a 16 quarter average balance and a 4% spending rate)**

65%/35% Stock/Bond Portfolio			100% Stock Portfolio		
Years with decrease in support from endowment (10)	Decrease for year	Decrease from previous high point	Years with decrease in support from endowment (12)	Decrease for year	Decrease from previous high point
1932	-3.7%		1932	-7.7%	
1933	-13.3%	-16.6%	1933	-20.6%	-26.7%
1934	-15.5%	-29.4%	1934	-30.5%	-49.0%
1935	-8.2%	-35.3%	1935	-20.5%	-59.4%
			1936	-5.9%	-61.8%
1941	-3.0%		1941	-7.6%	
1942	-7.0%	-9.8%	1942	-14.8%	-21.3%
1943	-0.1%	-9.9%			
			1973	-0.5%	
1974	-1.8%		1974	-6.1%	-6.6%
1975	-2.1%	-3.9%	1975	-5.3%	-11.6%
1976	-1.8%	-5.5%	1976	-4.9%	-16.0%
			1977	-0.5%	-16.4%

**Figure R.3:** Comparison of Years with Decreases in Budget Support from Endowment Spending  
**Source:** Advisor calculations

portfolio. Budget support from the endowment would have decreased in twelve of the years from 1927 to 2006. The table in figure R.3 compares the two cases.

The all-equity portfolio would have resulted in more years of decreased endowment support with larger declines in the level of support. Budget support would have dropped more than 16% in the mid 70s, and the decline during the 30s would have been more than 60%. Not surprisingly, the years of decreased support are clustered around the same years as for the 65% stock/35% bond portfolio. Note that using a twenty- or twenty-four-quarter average balance in the spending formula for the all equity portfolio reduces the number of years with decreases in spending, but only by one year.

Despite the greater volatility of support from the all-equity portfolio, it would have provided substantially more support overall—as is obvious from Figure R.2—and would have resulted in a higher current endowment level than the lower-risk, diversified portfolio. Note that the y-axis scales in both figures R.1 and R.2 are logarithmic; each vertical increment is a factor of ten. A \$100 endowment established at year-end 1925, invested 100% in equities, rebalanced annually to a 50% allocation each in large-cap and small-cap stocks, and with spending at 4% of a trailing four-year average balance would have been worth \$52,564 at December 2006 and would have provided \$1,704 of budget support for 2007. Compare this to the \$14,826 balance and \$516 of budget support provided by the same endowment invested 65% in U.S. stocks and 35% in U.S. bonds over the same time period. The organization with the all-equity portfolio would be much better off today, but would have had to weather some very hard times to survive to today, as evidenced by how the portfolios would have performed relative to the constraint of preserving the historic dollar value of original gifts.

We can test how portfolios would have preserved historic dollar value under two assumptions, first that spending would continue even if portfolio values are “under water” or below historic dollar value, and second that spending would be suspended if portfolio values are under water. Under the first assumption of continued spending, the portfolio would have fallen below the value of the original gift at only four year-ends, 1931 through 1934, for the 65% stock/35%



The best system for managing variable returns is a combination of portfolio risk reduction and spending policy formulation.

Traditional average balance spending formulas are not sufficient to deal with the uncertainty of future endowment returns.

bond portfolio. For the all-equity portfolio, the portfolio would have been below historic gift value at every year-end from 1930 through 1942, with the exception of 1936. Under the second assumption of suspended spending, the portfolio would have been below historic gift value at only two year-ends (1931 and 1932) for the diversified portfolio and at seven year-ends for the all equity portfolio (1930 through 1934, 1937, and 1941).

Overall, the historical record tells us that the risks of declines in spending support from an endowment due to variable endowment balances can be managed, but not entirely eliminated, with the use of a traditional average balance spending formula in combination with a modestly diversified portfolio. As appealing as it would be to have the results of an all-equity portfolio today, an organization would not likely have been able to endure the declines and losses of support that would have resulted from such an endowment investment strategy.

It would be dangerous, however, to draw conclusions about the effectiveness of risk management strategies just on the basis of history. The next eighty years will not look like the past eighty years. A more robust analysis requires that we test spending formulas and portfolio options over possible futures. We can construct these possible futures so that they resemble the past in terms of basic statistics—average returns, standard deviations, and correlations—but are different in the sequence of returns.†

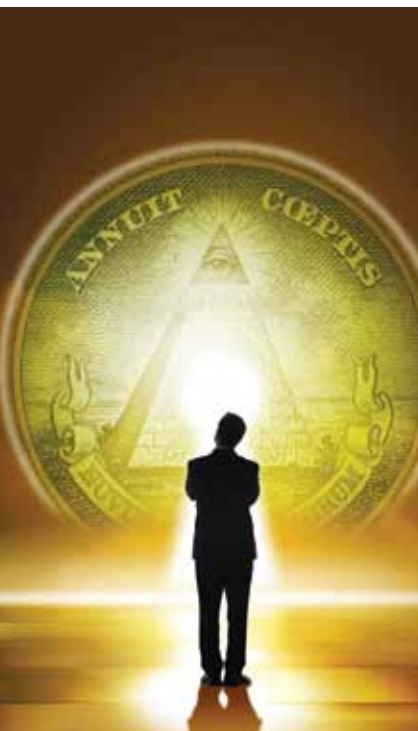
**COMPARISON OF YEARS WITH DECREASES IN BUDGET SUPPORT FROM ENDOWMENT SPENDING (using a 16 quarter average balance and a 4% spending rate)**

Historical Results (Hypothetical)			Results under Future Simulations	
65% Stock, 35% Bond	All-equity		65% Stock, 35% Bond	All-equity
1	1	Number of "histories"	50	50
81	81	Years/history	100	100
3	3	Number of periods with declining budget support	7.8 average 12 maximum 4 minimum	9 average 14 maximum 5 minimum
10	12	Number of years with decreased budget support	22 average 31 maximum 12 minimum	27 average 35 maximum 16 minimum
35.3%	61.8%	Largest drop in budget support, peak to trough	39.5% average 71.0% maximum 9.9% minimum	53.7% average 83.9% maximum 24.0% minimum

**Figure R.4:** Comparison of Years with Decreases in Budget Support from Endowment Spending, Hypothetical Historical Results versus Results under Simulated Futures  
 Source: Advisor calculations

When we test against future possibilities, we find more years of spending decreases with a four-year average balance spending formula than we might expect judging solely by the historical record. The table in Figure R.4 compares the results of testing the spending formula over fifty simulated futures, each one-hundred years long, with the historical results just reviewed.

† Alternative future portfolio returns and spending patterns were simulated with a program that generated sequences of log-normally distributed returns with medians and standard deviations approximating historical median returns and volatilities. Sequences were generated with a subroutine that produces normally distributed random numbers, which were then interpreted as standard errors of a log-normally distributed return function with a stipulated median and standard deviation. For the stock/bond simulation and the large-cap/small-cap simulation, pairs of sequences were generated with each one of the pair having a median return and standard deviation approximating the historical statistics for the relevant asset category and further subject to the requirement that the correlation between the paired sequences approximated the historical correlation. Median and standard deviations were required to be within 3% of the historical geometric average. Correlations were required to be within 2%.



The simulated results show that we can expect eight or nine periods of decreasing endowment support over the average next hundred years even using a four-year average balance in the spending formula. This compares to three periods of declining support over the past eighty years. On average, we can expect more than twenty years with decreases in budget support and an aggregate drop over some period of 40%.

These results are not comforting, especially since many endowment spending formulas are not as conservative as the one tested here. These results confirm, however, that the risk of variable budget support from endowment spending cannot be managed solely by use of a traditional average balance spending formula. Even if endowments did not face the risk of balances dropping below historic gift value and cutting off all endowment support, the risk of significant reductions in spending support requires that endowment managers and trustees also manage the risk of their portfolios. As tempting as the all-equity portfolio may be, it is too volatile.

It is tempting to discount the periods of reduced spending that would have occurred in the past since they would have all been associated with periods of significant economic disruption (the Great Depression, World War II, the oil embargo of the mid-70s) and to imagine a future of steady returns. When we consider the improvements in the regulation of the securities markets, the better understanding of economics and monetary policy, and the increase in global trade and cooperation that have occurred over the past eighty years, we may convince ourselves that the sustained economic disruptions of the past will not occur again. The future simulations, however, should convince us otherwise. In virtually every simulation, long periods (from twenty to sixty years) of sustained positive returns occur despite the fact that declines in spending resulting from sustained declines in balances also occur on average in 20% or more of all years. The majority of years with decreased endowment support are clustered together in periods of four years or longer. We do not know, nor, perhaps, can we imagine the circumstances that will result in such losses. We do know, however, that the simulated futures have basic statistics very similar to the past with comparable average returns, standard deviations, and correlations. Just considering the basic statistics for all of the “histories,” both actual and simulated, one would not be able to pick the real history from the simulations.

Why then do the simulated returns show more adverse results than the past eighty years? A glib answer would be that we have been lucky. A more thoughtful answer would consider a number of factors. Historical return data are characterized by additional statistics besides average return and standard deviation. Real parameters (especially correlations) vary over time, and using a single statistic to replicate a variable parameter may overlook the variability. Historical capital market return data show signs of serial correlation, which may not be captured in the randomly generated simulations. Each of these factors may contribute to simulated returns being more volatile than history. In the end, however, even if we could tailor our simulations to be more exact replicas of the past, would it be wise to do so? To the extent that we know and understand risk elements in historic return patterns, it is important to simulate them. Without a comprehensive understanding of historic capital market return patterns, however, any attempt to make future simulations less volatile appears unwise. We don't understand the past nearly as well as we should, and our future simulations should not be constrained, especially if they reveal more risk than we care to face.

The final steps in this analysis of the measurement and management of an institution's endowment risk tolerance we leave for the next issue. In the next issue, we will consider a very promising non-traditional spending formula that may allow organizations to optimize both spending and endowment growth while assuming less risk of spending declines than traditional average-balance spending formulas. We will also measure how effective the optimally risky portfolio is under future simulations and whether the use of an optimally risky portfolio provides sufficient portfolio risk management.

