White Paper

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The Yale Endowment Model of Investing Is Not Dead

Executive Summary

For many years, the Ivy League has been known for its traditions, its gothic buildings, and, until recently, the mystique of its mammoth-sized endowments that consistently generated incredibly high returns in bull and bear markets alike. Ivy League and other large endowments, weighing in at billions of dollars, were able to achieve these extraordinary results by following what is often called the "Yale Model" for endowments developed by Yale University's Chief Investment Officer, David Swensen, under which they invested heavily in alternatives such as private equity and hedge funds. Until very recently, it seemed to some that the Yale Model was invincible.

This all came to a grinding halt, however, in the past year when the largest university endowments—those of Harvard and Yale—stunned the investment world when they announced losses of 27% and 25%, respectively, for the fiscal year ended June 30, 2009. This shocking news led many to declare that modern portfolio theory, the intellectual underpinning of the Yale Model, was dead. Upon closer inspection, however, it becomes clear that the problem is with neither modern portfolio theory nor asset allocation, but rather with the endowments' policies of holding shockingly small amounts of cash in their portfolios relative to the amounts needed to finance the day-to-day operations of their respective universities.

This white paper will argue that the melt down at certain endowments had nothing to do with purported flaws in modern portfolio theory. Instead, the breakdown was caused by a failure to model for truly extreme events. Given the enormous obligations of many Ivy League endowments to fund general university operations, their portfolios were positioned on the wrong point of the efficient frontier. In other words, given their liabilities, they simply invested far *too little* in cash and liquid assets rather than *too much* in alternatives like private equity.

KEATING INVESTMENTS

Modern Portfolio Theory and Asset Allocation

Modern portfolio theory relies on the assumption that each asset class has a measureable historical return ("mean"), volatility ("variance") and historical correlation with respect to each other asset class ("covariance"). This mean-variance framework is used to construct optimal portfolios based on risk and return assumptions. The idea is that by diversifying a portfolio to include asset classes that have different correlations, it reduces risk. For example, if the stock market declines, those assets that are strongly correlated to the stock market will also decline, but at the same time, those that are negatively correlated to the market will rise, thus reducing any loss or even producing gains.[1]

The Yale Model. Relying heavily on modern portfolio theory, the managers of the Yale endowment, under the direction of David Swensen, developed the following five principles that make up the basis for what has become known as the Yale Model:

1. Invest in equities, because it is better to be an owner rather than a lender.
2. Hold a diversified portfolio, avoid market timing and fine tune allocations at extreme valuations.
3. Invest in private markets that have incomplete information and illiquidity to increase long-term incremental returns.
4. Use outside managers except for all but the most routine or indexed investments.
5. Allocate capital to investment firms owned and managed by the people actually doing the investing to reduce conflicts of interest.[2]

Guided by these principles, the Yale endowment is diversified in alternatives and invests almost exclusively in equities. Although universities with smaller endowments are limited in their ability to invest in alternatives because they rely on the endowments for cash, large endowments typically have long-term investment horizons and can afford to trade greater short-term illiquidity for long-term returns.[3]

The Success of Ivy League Endowments. The Yale endowment has achieved enormous success under the 24 year leadership of Swensen, enticing many other large endowments to emulate the Yale Model. As **Table 1** shows, these schools invested heavily in alternatives such as hedge funds, foreign equity, and private equity, with tiny allocations to bonds.[4]

Over the past decade, these heavily equity/alternatives-skewed asset allocations produced outstanding results. For the ten years ending June 30, 2008, the Yale endowment produced an annual return of 16.3%, Harvard 13.8%, and Princeton 14.9%. To put this performance into perspective, the S&P 500 during these years returned only 2.9% annually.[5] These annual returns translated into explosive growth of the endowments during this time period, with Harvard's growing to $36.9 billion from $13 billion, Yale's shooting up to $22.9 billion from $6.6 billion, and Princeton's growing to $16.3 billion from $5.6 billion.[6]

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[1] Bary, Andrew. "Big Squeeze on Ivy League Endowments." *Barron's* Jul. 1, 2009.
[2] Swensen, David, *Pioneering Portfolio Management*, New York: Free Press, 2009.
[3] Bary.
[4] Ibid.
[5] Ibid.
[6] Ibid.

The Breakdown of the Yale Model

Despite all of the successes of the decade, the fiscal year that recently ended has been a veritable nightmare for large endowments. Even the Yale endowment, the pioneer of the new endowment model, has suffered stunning losses.

What Happened? The breakdown of the Yale Model stems from the fundamental illiquidity that characterizes most alternative investments. By stark contrast, smaller endowments (those with under $1 billion under management) were able to outperform the large endowments by significant margins because they put more money in fixed income and less into alternatives.[7] **Table 1** below shows the large endowments' asset allocations in comparison to the average allocations for all education endowments. The large endowments invested much more heavily than average in alternatives, especially in private equity, and less in bonds and cash, which were the only two asset classes that have had a positive return since June 2008. In fact, the Harvard and Yale endowments actually had negative allocations of their respective portfolios in cash![8]

Table 1: Asset Allocations for Large Endowments, Average Education Endowment, and Estimated Return from June '08 – June '09[9]

Endowment	Hedge Funds	Domestic Equity	Bonds	Foreign Equity	Private Equity	Real Assets	Cash
Harvard	18%	11%	11%	22%	13%	26%	-3%
Yale	25%	10%	4%	15%	20%	29%	-4%
Princeton	24%	7%	2%	12%	29%	23%	2%
Stanford	18%	37%	10%	N/A	12%	23%	N/A
Avg. Education Endowment	22%	22%	12%	20%	9%	14%	2%
Estimated Return since June '08	-20%	-27%	6%	-31%	-50%	-47%	2%

Nearly all endowments suffered, but large endowments following the Yale Model have been hit harder than most. The median decline in return for all endowments in the fiscal year ended June 30, 2009 was 19%, while the S&P 500 lost 26.2% over the same timeframe.[10] The large Ivy League endowments, however, have fared worse, with Harvard and Yale experiencing 27% and 25% respective declines in their endowments.[11] Combined, these two investment pools lost an astounding $17.8 billion in the last fiscal year.[12]

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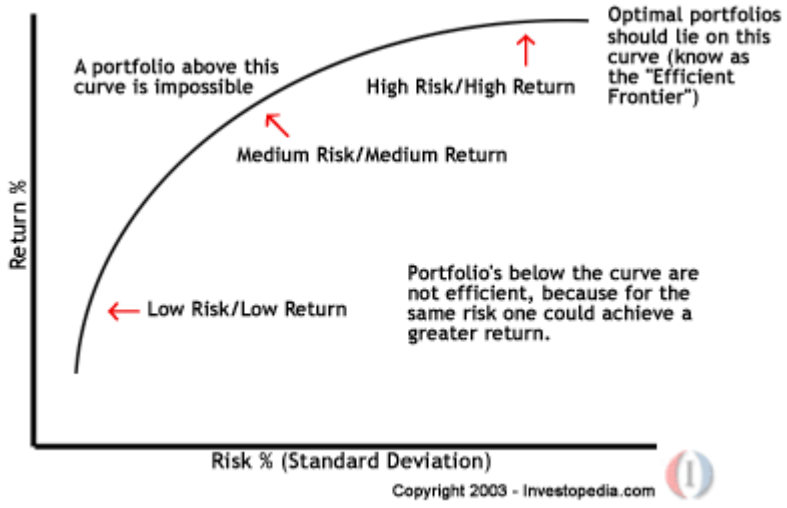
[7] Karmin, Craig. "Ivy League Endowments Finally 'Dumb'." *Wall Street Journal*, Jun. 30, 2009.
[8] Bary.
[9] Ibid.
[10] Demos, Telis. "Which Ivy Performed Best." *Fortune*, Oct. 12, 2009, p. 14.
[11] Ibid.
[12] Hechinger, John. "Harvard, Yale are Big Losers in 'The Game' of Investing." *Wall Street Journal*, Sep. 11, 2009.

So bad did it get that the cash-strapped Ivy League universities were humbled into actually borrowing money by issuing bonds just to pay for their daily operating expenses.[13] This is because Ivy League schools rely on their endowments to fund more than 25% of their day-to-day operations, compared to the average 5% for all colleges, making liquidity especially critical for the daily operations of the Ivies.[14] In fact, Harvard's endowment distributed $1.7 billion to the university in fiscal 2009, which accounted for more than a third of the university's operating budget.[15] These distributions are in addition to unfunded investment commitments to private equity and real estate funds. As of June 30, 2008, these investment commitments were $11 billion at Harvard, $8.7 billion at Yale, and $6.1 billion at Princeton.[16] Normally, the endowments finance these commitments with current income and distributions from existing funds. When the distributions dried up, however, the endowments found themselves in desperate need of cash. As a result of their lack of cash, they had to go hat in hand to the bond market. Last year, Harvard took on $1.5 billion in debt, Princeton took on $1 billion, and Yale took on $800 million.[17]

One of the cornerstones of modern portfolio theory is that an optimal portfolio should lie on the efficient frontier, yielding the highest expected return possible for the given amount of risk (see **Figure 1**). Many of these large university endowments were clearly positioned in the high risk/high return portion of the curve. Absent any need for short-term liquidity, this seems like a logical risk/return profile for a patient, long-term investor. The issue, of course, is that these endowments have significant ongoing short-term liabilities and thus have a corresponding need for short-term liquidity to fund these liabilities.

Figure 1: Risk-Return Curve Representing the Efficient Frontier



[13] Bary.
[14] Karmin, "Ivy League Endowments Finally 'Dumb'."
[15] Salsberg, Bob. "Harvard's Endowment Drops Sharply Amid Recession." *Associated Press*, Sep. 10, 2009.
[16] Bary.
[17] Ibid.

In the bull market years, endowments boomed, leading to policy decisions that implicitly assumed that the cash would be free flowing perpetually. How else to explain an enormous allocation to illiquid investments, little or no cash, coupled with an obligation to fund a meaningful portion of the operating budget annually? As **Table 2** illustrates, investment commitments comprised a large portion of endowment funds to begin with, and, as these funds shrank, the commitments consumed a larger proportion of funds. Furthermore, budgets had reached all time highs by using endowment contributions to finance enormous percentages of the budget.

Of course, university endowments enjoy the benefits of regular cash inflows from alumni donations. However, as people experience declines in wealth, their marginal propensity to consume/donate also declines (the negative wealth effect). In the recent financial crisis, the Ivy League endowments suffered from the double jeopardy of shrinking asset values accompanied by shrinking donations, which in turn were caused by the negative wealth impact of decimated portfolios.

Table 2: Stress on Ivy League Investment Commitments and Annual Budgets from Shrinking Endowments[18] [19] [20]

Endowment Feature	Harvard	Yale	Princeton
Endowment Size (billion)			
On June 30, 2008	$36.9	$22.9	$16.3
On June 30, 2009	$26.0	$16.3	$12.6
Y/Y Decline	-27%	-25%	-23%
Investment Commitments (billion)*	$11.0	$8.7	$6.1
Annual Budget (million)	$1,100**	$2,280	$1,360
Contribution from Endowment			
Dollars (million)	$600	$850	$653
Percentage	55%	37%	48%
Academic Year	'08 – '09	'07 – '08	'08 – '09
*Commitments as of June 30, 2009. **Faculty of Arts and Sciences			

In order to remedy these issues, university endowments are aiming to redefine their asset allocations. Harvard, specifically, reduced its risk exposure by raising cash, removing $3 billion in future commitments to investment funds, and reducing its real-asset allocation to 23% from 26%. Harvard has also said the endowment now aims to hold 2% of its assets in cash as opposed to the previous -5% position, which reflected borrowed cash used to invest in other asset classes.[21]

[18] Bary.
[19] Demos, p. 14.
[20] "Princeton endowment down, but not as bad as feared." *Associated Press*, Sep. 29, 2009.
[21] Hechinger.

A Different Experience at Penn and Columbia. A few endowments were able to avoid taking large losses, and these endowments typically used investment strategies that differed significantly from the Yale Model. The University of Pennsylvania's endowment, for example, while still sustaining a loss, did better than many of its Ivy League peers by shifting a significant portion of its portfolio into Treasurys. The large Treasury position provided enough liquidity to allow Penn's endowment to meet its investment commitments to private equity funds that caused the other Ivy League endowments so much trouble.[22] Columbia also allocated more to stocks relative to alternative investments. As a result, the Penn endowment experienced a relatively modest decline of 16% for the year, while Columbia showed losses of 14%.[23]

What caused this colossal failure in large endowments following the Yale Model? Many have squarely pointed the finger at modern portfolio theory, claiming that asset allocation no longer works because many asset classes have become so highly correlated. We disagree.

Modern Portfolio Theory Is Not Dead

All models are only as good as the assumptions underlying them. The mean-variance framework of modern portfolio theory relies heavily on historical returns to predict future outcomes. When markets collapse, asset classes become very highly correlated.

Converging Correlations During Extreme Events. During extreme events, a shock often starts in one asset class and quickly spreads to other risky asset classes, causing flights to quality and liquidity (i.e. Treasurys). When this happens, the return on an asset becomes inversely proportional to its riskiness, precisely the opposite of what happens during normal times. In the last 22 years alone, there have been many crises that fit this description, including: Black Monday (1987), the Gulf War (1990), the Mexican Crisis (1994), the Asian Crisis (1997), the Tech Bubble Crisis (2000), 9/11 (2001), and the Credit Crisis (2008).[24] During these periods of extreme stress, diversification has provided little benefit, because correlations converged to one and all asset classes declined in tandem.

Modern portfolio theory relies on covariance matrices to calculate correlations among different sets of securities. Sharpe's "one-factor model," which assumes that securities are correlated with each other only because they are all correlated with the market, provides a convenient framework for examining correlation and diversification. Sharpe maintains that the return ("R") on a security is equal to a constant, called the security's alpha ("α"), plus another constant, the security's beta ("β"), times the underlying market return ("R_M"), plus an independent, random idiosyncratic term, interpreted as unsystematic risk ("ρ"). In other words, $\mathbf{R = \alpha + \beta(R_M) + \rho}$. In this model, α represents the security's additional return unrelated to the market, and β represents the security's coefficient of volatility relative to the market, which is determined from historical data. Beta is also known as "systematic risk." Thus, the variability in any security's return can be explained by moves in the market and idiosyncratic risk.[25] For example,

[22] Karmin, Craig. "Penn's 15.7% Decline Tops Ivy League Rivals." *Wall Street Journal*, Aug. 11, 2009.
[23] Demos, p. 14.
[24] Briand, Remy and David Owyong (Jul./Aug. 2009). "How to Kill a Black Swan," *Journal of Indexes*, vol. 12 (4), p. 11.
[25] Markowitz, Harry M. (Spring 2009). "Crisis Mode: Modern Portfolio Theory under Pressure." *The Investment Professional*, vol 2 (2).

assuming the market goes up by 10% and ρ is -5%, a security with α of 5% and β of 1.5 would have a 15% return.

To calculate the return of an entire portfolio, we use the weighted average ("$_{avg}$") of the individual securities' returns, which would be expressed as $\alpha_{avg} + \beta_{avg} (R_M) + \rho_{avg}$. Both α and β are constants, but ρ is random (i.e. some securities in a well diversified portfolio will have a negative ρ and others will have a positive ρ). This means that the variance of the idiosyncratic term for the portfolio is much smaller than that for each of the individual securities, so diversification reduces the risk represented by ρ. However, systematic risk (i.e. the market return) cannot be diversified. Risk can be lowered by decreasing β_{avg}, but that also lowers the potential for return. When the market moves dramatically downward as it did in 2008, the systematic risk will swamp the idiosyncratic risk, negating the benefits of diversification.

The Misleading Nature of Asset Classifications. Traditional categories of asset classes such as equities, fixed income, and alternatives refer more to the structure of the asset rather than the role the asset plays in a well-diversified portfolio. In short, an asset that is in the equities category may in fact be highly correlated to another asset that is in the alternatives category, making diversification among equities and alternatives less appropriate than otherwise assumed. For example, the alternatives category includes hedge funds, private equity, and private real estate assets. Several studies, however, have shown that hedge fund strategies have a high component of traditional beta, private equity returns are highly correlated to public equity returns, and privately held and managed real estate assets follow the ups and downs of public real estate assets. These can lead to portfolios that are well-diversified in terms of asset classification but not in real world performance.[26]

Managing for Extreme Events: The Black Swan. So what can or should the large endowments do to prepare their portfolios to better withstand crises? One solution is to better model and manage risk for extreme events using the concepts of value at risk and extreme value theory.

Value at risk is a statistic used to measure downside risk. It's defined as the maximum loss that a portfolio is expected to incur over a specified period of time, within a specified probability. For example, if the one-year 99% value at risk is 30%, then there is only a 1% chance that the portfolio will decline more than 30% in one year. A common problem with value at risk measures is that managers tend to assume that returns are normally distributed, which underestimates the chance of extreme events (the so-called "black swan"). In reality, return distributions usually have "fat tails," meaning that extreme events are more likely (a risk referred to as "tail risk"). The solution is to use extreme value theory to produce a generalized extreme value distribution which can more accurately predict the pattern of returns as well as the chance of extreme events.[27]

Once the probability of extreme events is properly determined, managers can use a portfolio business continuity plan to manage tail risk. This involves first defining what they consider to be an extreme event, which includes precise values of returns, volatility, value at risk, or some combination of these factors. Another useful protocol is to perform stress tests for the portfolio to see how well the portfolio holds up against the biggest current threats. Finally, actions involving portfolio trades to mitigate tail risk should be planned for as and when the black swan occurs.

[26]Briand and Owyong, p. 15.
[27] Ibid., p. 12.

Where the large endowments really broke down was in their failure to maintain liquidity into their portfolios to withstand the shock of an extreme event. The endowments succumbed to the egregious fallacy that as long-term investors they had no need for short-term liquidity. These are the same endowments that are obliged to fund 25% to 45% of their respective universities' operating budgets and had outstanding investment commitments totaling in the billions. They were simply caught with embarrassingly little cash.

Conclusion

Given the immense and ongoing cash needs of the large university endowments, it is shocking how little cash they actually had in their portfolios. The fault, however, is not that the endowments invested *too much* in alternatives like private equity, but that they invested far *too little* in cash and liquid assets.

Modern portfolio theory and asset allocation are not dead, and alternatives can and do play an important role in a well-constructed and well-diversified portfolio. The difficulties the large endowments faced this past fiscal year do not reflect a breakdown of the principles of asset allocation, but rather a failure on the part of the endowment managers to properly diversify their portfolios and plan for extreme events. In the future, the endowments must model and prepare for extreme events, evaluate whether the classification of their assets genuinely reflect true diversification, and perhaps most importantly, appropriate a much larger portion of their portfolios to cash and other liquid assets.

Keating Investments, LLC is a Denver-based SEC registered investment adviser founded in 1997. The firm is the investment adviser to Keating Capital, Inc. (www.KeatingCapital.com), a publicly reporting Business Development Company that is an equity capital partner for select private businesses that are primed to become public companies. Timothy J. Keating is the founder and President of Keating Investments. Previously, he held senior management positions in the equity and equity derivative departments of Bear Stearns, Nomura and Kidder, Peabody in both London and New York. He is a 1985 *cum laude* graduate of Harvard College with an A.B. in economics. He can be reached at (720) 889-0131 or at tk@keatinginvestments.com.