

2002

The Yale Endowment



Endowment Highlights

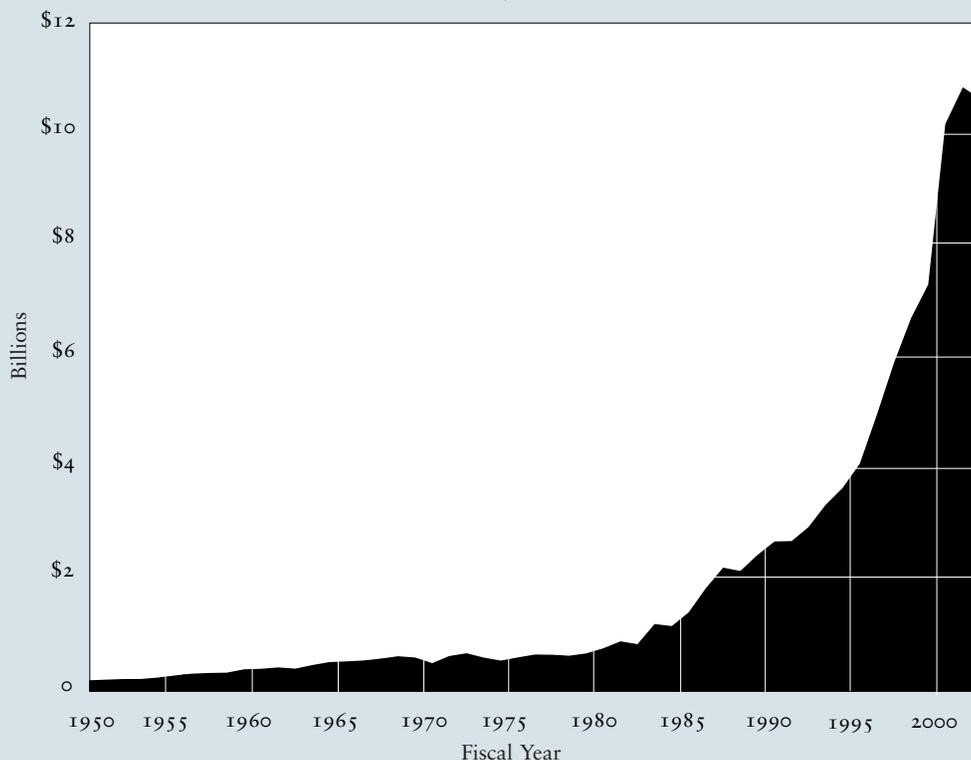
	Fiscal Year				
	2002	2001	2000	1999	1998
Market Value (in millions)	\$10,523.6	\$10,725.1	\$10,084.9	\$7,185.6	\$6,597.9
Return	0.7%	9.2%	41.0%	12.2%	18.0%
Spending (in millions)	\$ 409.3	\$ 337.5	\$ 280.8	\$ 254.2	\$ 218.9
Operating Budget Revenues (in millions)	1,466.6	1,352.9	1,263.5	1,252.1	1,184.5
Endowment Percentage	27.9%	24.9%	22.2%	20.3%	18.5%

Asset Allocation (as of June 30)

Domestic Equity	15.4%	15.5%	14.2%	15.1%	19.2%
Absolute Return	26.5	22.9	19.5	21.8	27.1
Foreign Equity	12.8	10.6	9.0	11.1	12.1
Private Equity	14.4	18.2	25.0	23.0	21.0
Real Assets*	20.5	16.8	14.9	17.9	13.0
Fixed Income	10.0	9.8	9.4	9.6	10.1
Cash	0.3	6.2	8.1	1.5	-2.5

*Prior to 1999, Real Assets included only real estate. Oil and gas and timber were classified as Private Equity.

Endowment Market Value 1950–2002



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View of Wrexham Tower, from Branford Courtyard.

Introduction

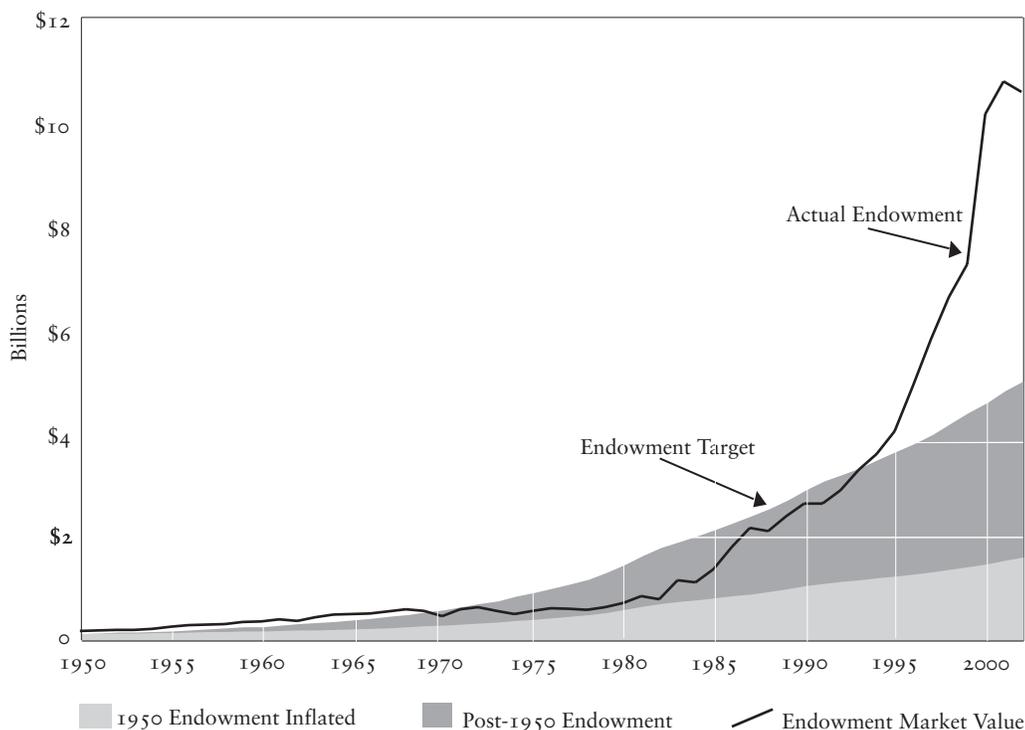
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Diversification once again helped the Yale Endowment weather stormy markets during the year ending June 30, 2002. The Endowment returned a respectable 0.7 percent in an atmosphere in which equity markets registered severe declines and most endowments suffered negative returns. Strong active management and a value orientation protected Yale from bearing fully the costs of the recent market turmoil.

During the past ten years, the Endowment grew from \$2.8 billion to \$10.5 billion. With annual net investment returns of 16.9 percent, the Endowment's performance exceeded its benchmark and outpaced institutional fund indices. Over the past two decades, the Yale Endowment produced even more dramatic results, as investment returns of 17.0 percent per annum produced a 2002 Endowment value of over 14 times 1982's level. Yale's long-term record resulted from disciplined and diversified asset allocation policies, superior active management results, and strong capital market returns.

Spending from Endowment grew during the last decade from \$108 million to \$409 million, an annual growth rate of 14.2 percent. On a relative basis, Endowment contributions grew from 13.2 percent of total revenues in fiscal 1992 to 27.9 percent in fiscal 2002. Next year, spending will approach \$471 million, or 31 percent of projected revenues. During the decade Yale's spending and investment policies provided handsome growth in cash flow to support current scholars while preserving Endowment purchasing power for future generations.

Endowment Growth Outpaces Inflation 1950–2002



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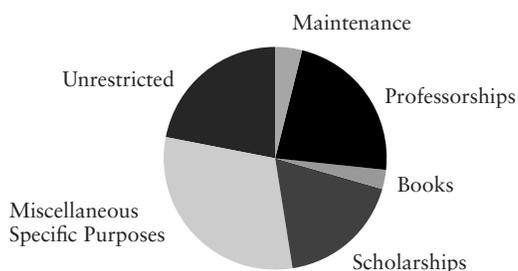
Totaling \$10.5 billion on June 30, 2002, the Yale Endowment is an investment pool composed of thousands of funds with a variety of designated purposes and restrictions. Approximately four-fifths of funds are true endowment, gifts restricted by donors to provide long-term funding for designated purposes. The remaining one-fifth is quasi-endowment, monies which the Yale Corporation chooses to invest and treat as endowment.

Donors frequently specify a particular purpose for gifts, creating endowments to fund professorships, teaching, and lectureships (23 percent), scholarships, fellowships, and prizes (18 percent), maintenance (4 percent), books (3 percent), and miscellaneous specific purposes (31 percent). The remaining funds (22 percent) are unrestricted. Thirty-four percent of the Endowment benefits the overall University, with remaining funds focused on specific units including the Faculty of Arts and Sciences (32 percent), the Professional Schools (21 percent), the library (8 percent), and other entities (6 percent).

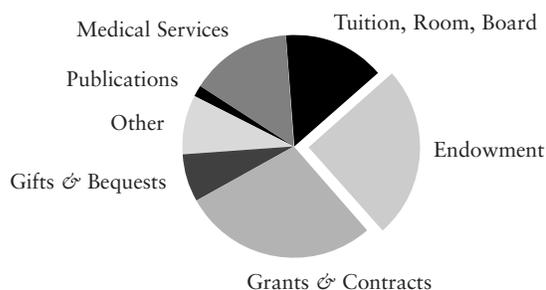
Although distinct in purpose or restriction, Endowment funds are commingled in an investment pool and tracked with unit accounting much like a large mutual fund. Endowment gifts of cash, securities, or property are valued and exchanged for units that represent a claim on a portion of the whole investment portfolio.

In fiscal 2002, the Endowment provided \$409 million, or 28 percent, of the University's \$1,467 million current fund income. Other major sources of revenues were grants and contracts of \$418 million (28 percent), medical services of \$214 million (15 percent), net tuition, room, and board of \$209 million (14 percent), gifts of \$86 million (6 percent), other investment income of \$27 million (2 percent), publications income of \$23 million (2 percent), and other income of \$82 million (6 percent).

Endowment Fund Allocation
Fiscal Year 2002



Operating Budget Revenue
Fiscal Year 2002



Policy Asset Allocation Targets

Establishing policy asset allocation targets represents the heart of the investment process, as no other aspect of portfolio management plays as great a role in determining a fund's ultimate performance. Yale's target allocation is achieved using a combination of quantitative and qualitative analysis. By employing the quantitative tool of mean-variance optimization, the Investments Office identifies efficient portfolios with expected returns that surpass those of all other portfolios with the same level of risk. Inputs to the process include estimated return, risk, and correlation measures for different asset classes. Important qualitative considerations include the nature of active management opportunities, the degree of asset class illiquidity, the value of gradualism in making changes, and Yale's comparative advantages as an investor.

In producing portfolio recommendations, the Investments Office complements top-down mean-variance optimization with bottom-up assessment of market conditions. By evaluating the absolute and relative attractiveness of investment opportunities uncovered by Yale's far-ranging roster of external investment managers, the Investments Office directs funds to more attractive opportunities and away from less compelling situations. Nonetheless, given the long-term nature of policy targets, bottom-up considerations play a secondary part in the asset allocation process relative to the lead role of mean-variance optimization.

In June 2002 the University adopted a number of significant changes in policy targets. Private equity moved from a target of 25.0 percent of the portfolio to 17.5 percent, while real assets moved from 17.5 to 20.0 percent, absolute return moved from 22.5 to 25.0 percent, and foreign equity moved from 10.0 to 12.5 percent. After three years in which policy targets remained unchanged, the flurry of activity represented an important change in the character of the target portfolio.

Over the past two years, Yale's actual private equity allocation decreased from 25.0 percent of assets to 14.4 percent due to distributions of cash and securities, write-downs of investments, and reduced rates of new investment.

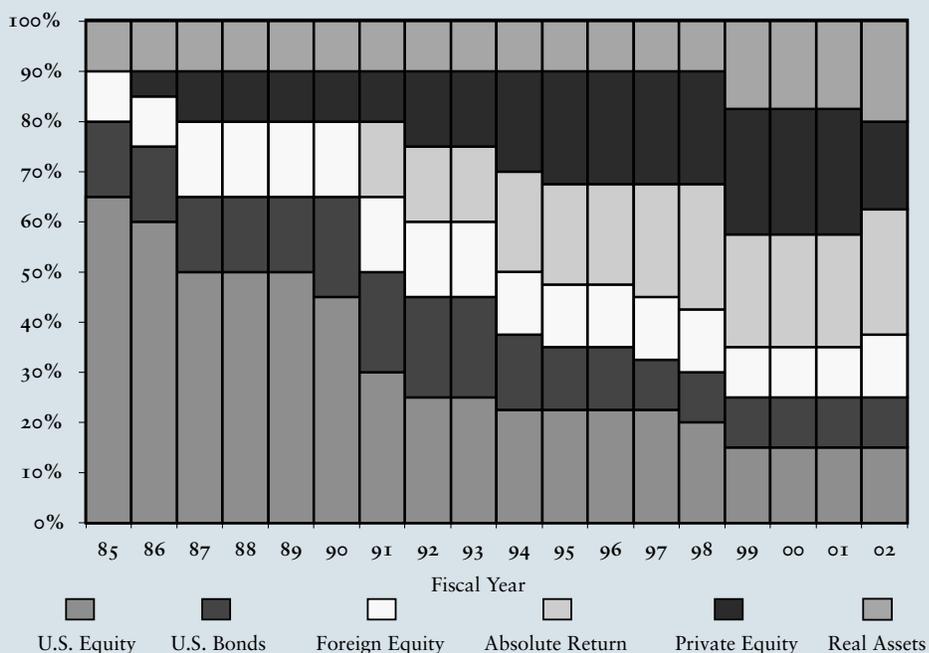
In order to have closed the gap between the current actual allocation and the former target allocation, Yale would have needed to invest significant amounts of new capital in private equity strategies.

Currently, however, the private equity marketplace appears less attractive than it has in the past. The deluge of capital entering the private equity sector, the relentless transformation of moderate-sized funds into mega-funds, the increased competition for deals and personnel, and the reduced ability to use public markets to exit private investments combine to diminish expectations for the asset class. Moreover, regardless of the current prospects for private equity, the University prefers to take a gradual approach to making portfolio moves. By setting the new private equity target at 17.5 percent—measurably above the current actual allocation—Yale expresses a desire for deliberate growth in private equity exposure over the next few years. The difficult conditions in the private equity markets accentuate the ever-present need to be highly selective in choosing investment partners for the University.

Yale's newly adopted target asset allocation produces an expected real (after inflation) long-term growth rate of 6.2 percent per annum with a risk (standard deviation of returns) of 10.9 percent. This risk-return combination compares favorably to the average endowment portfolio, which offers an expected real return lower than Yale's, with higher risk. Yale's spending disruption risk—defined as the likelihood of a real reduction of 10 percent in spending from the Endowment over any five-year period—is 20 percent for the current target portfolio. Impairment risk—defined as the likelihood of losing half of purchasing power over a 50-year horizon—is 7 percent. In contrast, the average endowment runs a 37 percent chance of spending disruption and a staggering 40 percent chance of impairment.

Throughout the 17 years during which Yale engaged in a disciplined annual review of policy targets, only in two instances did the University make changes as large as it did in 2002. The first, a 1986 reduction of 10.0 percent in domestic equities combined with 5.0

Yale Diversifies Policy Asset Allocation Targets 1985–2002



(reading from bottom to top of graph)

percent increases in both private equity and foreign equity, occurred early in Yale's process of moving to a more diversified investment portfolio. The second, a 1990 reduction of 15.0 percent in domestic equities to fund the newly created absolute return asset class, represented a reclassification of assets, not a change in portfolio composition.

Even though Yale's portfolio has changed dramatically from its position in the mid 1980s, moving from a typical institutional portfolio dominated by marketable securities to a well-diversified equity-oriented collection of assets, the year-to-year changes tended to be small. Most years saw changes in targets of 2.5 or 5.0 percent; in fact, in six of 17 years no changes occurred at all.

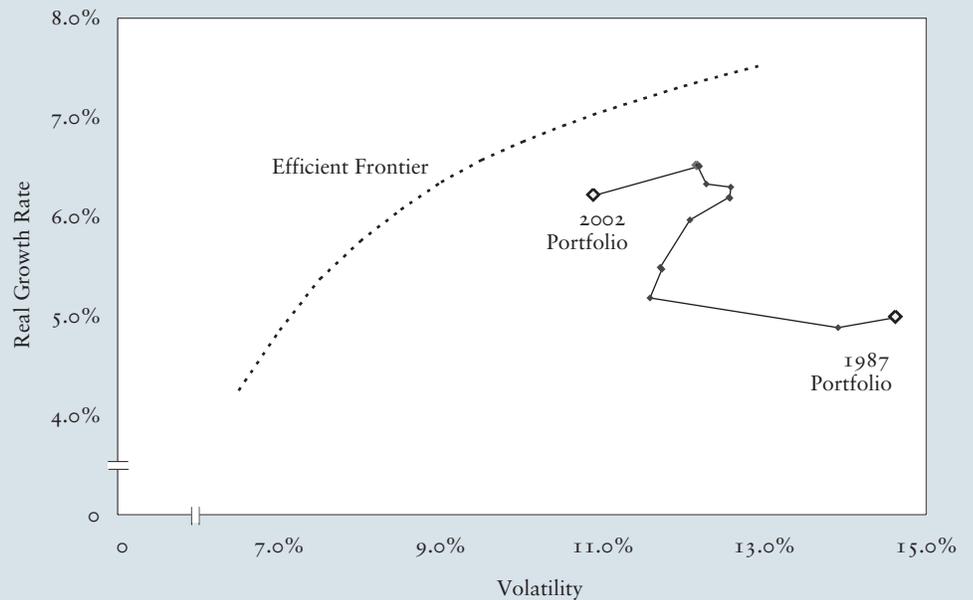
Yale's asset allocation targets are reviewed only once per year, limiting the possibility of damage from ill-considered moves made in response to the gloom or euphoria imbuing current market conditions. During the 1987 stock market crash, a 25 standard deviation event in which the domestic market fell more than 20 percent in one day, Yale maintained policy targets in the face of pressure to move assets into fixed income. In fact, shortly following the crash, Yale purchased tens of millions of dollars of S&P 500 Index futures to rebalance the portfolio to long-term targets. While other institutions sold equity positions for losses, purchased bonds at exorbitant prices, and missed the ensuing recovery, Yale did not reverse—after the fact—positions it had adopted as part of a recent annual policy target review. Accordingly the University was spared from an untimely reversal of strategy.

Serious investors recognize that the principles of diversification and equity orientation underlie successful long-term investment strategies. Yet, honoring these basic tenets represents the exception rather than the rule. In the mid 1980s typical endowment portfolios exhibited neither diversification nor equity orientation, as they consisted of roughly 50 percent marketable equities, 45 percent bonds and cash, and 5 percent alternative strategies. A decade and a half later, average allocations have made little progress, with approximately 53 percent in marketable equities, 26

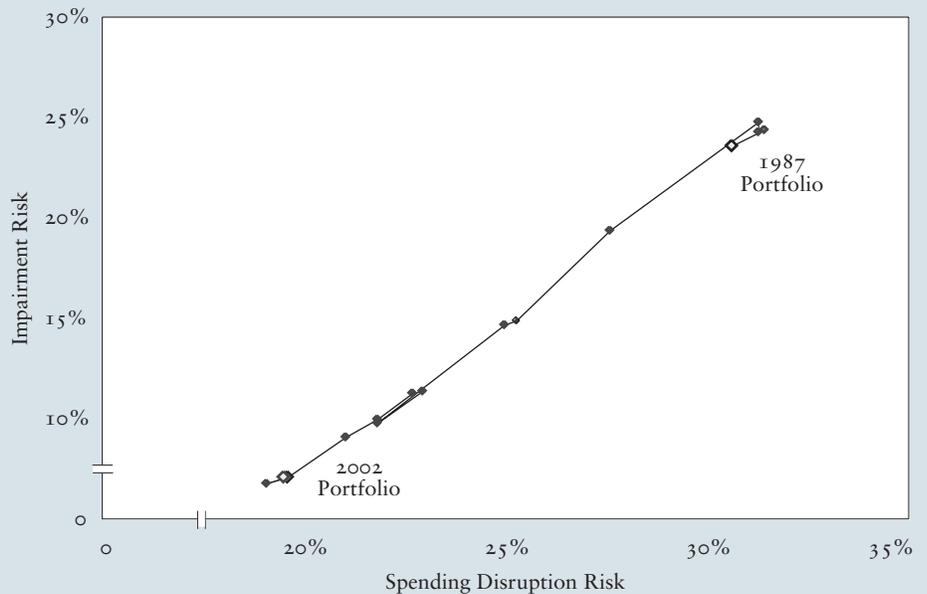
percent in bonds and cash, and 21 percent in alternative strategies. In contrast, with Yale's six asset classes exhibiting allocations between 10 and 25 percent, the portfolio meets the test of diversification; with five high expected return asset classes accounting for 90 percent of assets, the portfolio

embodies a substantial equity orientation. By implementing a diversified, equity-oriented asset allocation, Yale's Endowment is well positioned to serve the needs of both current and future generations of scholars.

Yale's Portfolio Moves Toward Risk-Return Efficiency



Yale Reduces Spending Disruption Risk and Purchasing Power Impairment Risk



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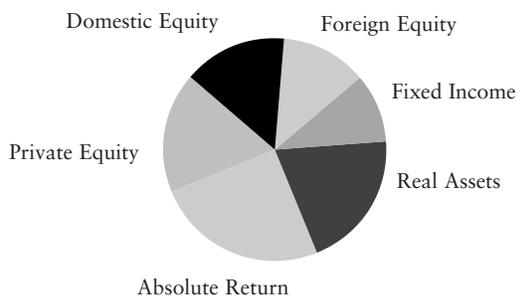
Yale’s portfolio is structured using a combination of academic theory and informed market judgment. The theoretical framework relies on mean-variance analysis, an approach developed by Nobel laureates James Tobin and Harry Markowitz. In fact, both Tobin and Markowitz conducted work on this important portfolio management tool at Yale’s Cowles Foundation. Using statistical techniques to combine expected returns, variances, and covariances of investment assets, the analysis estimates expected risk and return profiles of various asset allocation alternatives and tests the sensitivity of the results to changes in input assumptions.

Because investment management involves as much art as science, qualitative considerations play an extremely important role in portfolio decisions. The definition of an asset class is quite subjective, requiring precise distinctions where none exist. Returns and correlations are difficult to forecast. Historical data provide a guide, but must be modified to recognize structural changes and compensate for anomalous periods. Finally, quantitative measures have difficulty incorporating factors such as market liquidity or the influence of significant, low-probability events.

The combination of quantitative analysis and market judgment employed by Yale produces the following portfolio:

Asset Class	June 2002	Current Target
Domestic Equity	15.4%	15.0%
Fixed Income	10.0	10.0
Foreign Equity	12.8	12.5
Absolute Return	26.5	25.0
Private Equity	14.4	17.5
Real Assets	20.5	20.0
Cash	0.3	0.0

Yale Endowment Target Asset Allocation
June 30, 2002



The target mix of assets produces an expected real (after inflation) long-term growth rate of 6.2 percent with a risk (standard deviation of returns) of 10.9 percent. Primarily because of shortfalls relative to the target in private equity holdings, the actual allocation produces a portfolio expected to grow at 6.0 percent with a risk of 10.4 percent. The University's measure of inflation is based on a basket of goods and services specific to higher education that tends to exceed the Consumer Price Index by approximately one percent.

The need to provide resources for current operations as well as preserve purchasing power of assets dictates investing for high returns, causing the Endowment to be biased toward equity. In addition, the University's vulnerability to inflation further directs the Endowment away from fixed income and toward equity instruments. Hence, 90 percent of the Endowment is targeted for investment in some form of equity, through holdings of domestic and international securities, real assets, and private equity.

Over the past fifteen years, Yale has reduced dramatically the Endowment's dependence on domestic marketable securities by reallocating assets to nontraditional asset classes. In 1987, over 75 percent of the Endowment was committed to U.S. stocks, bonds, and cash. Today, target allocations call for 25 percent in domestic marketable securities, while the diversifying assets of foreign equity, private equity, absolute return strategies, and real assets dominate the Endowment, representing 75 percent of the target portfolio.

The heavy allocation to nontraditional asset classes stems from their return potential and diversifying power. Today's actual and target portfolios have significantly higher expected returns and lower volatility than the 1987 portfolio. Alternative assets, by their very nature, tend to be less efficiently priced than traditional marketable securities, providing an opportunity to exploit market inefficiencies through active management. The Endowment's long time horizon is well suited to exploiting illiquid, less efficient markets such as venture capital, leveraged buyouts, oil and gas, timber, and real estate.

Asset Class Characteristics

Yale's six asset classes are defined by differences in their expected response to economic conditions, such as price inflation or changes in interest rates, and are weighted in the Endowment portfolio by considering risk-adjusted returns and correlations. The University combines these assets in such a way as to provide the highest expected return for a given level of risk.

Domestic Equity

Finance theory predicts that equity holdings will generate returns superior to those of less risky assets such as bonds and cash. The predominant asset class in most endowments and other U.S. institutional portfolios, domestic equities represent a large, liquid, and heavily researched market. While the average educational institution invests 39.3 percent of assets in domestic equities, Yale's target allocation to this asset class is only 15.0 percent. The domestic equity portfolio has an expected real return of 6.0 percent with a standard deviation of 20.0 percent. The Wilshire 5000 Index serves as the portfolio benchmark.

James Tobin, 1918–2002

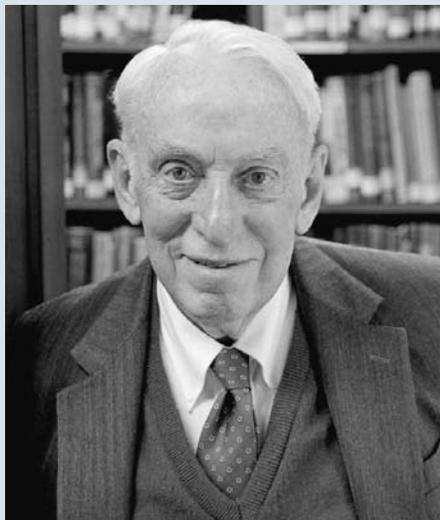
James Tobin, who served Yale for half a century, passed away in March 2002 at the age of 84. Considered one of the most influential economists of his time, Tobin focused his research on how economic policies affect people's lives, adhering to the Keynesian belief that the federal government should use fiscal and monetary policy for society's benefit. He noted that economics "offered the hope, as it still does, that improved understanding could better the lot of mankind." Tobin wrote or edited 13 books and hundreds of articles, winning the Nobel Prize in 1981 for his analysis of financial markets.

Tobin became interested in economics while growing up in Illinois during the Great Depression. He pursued this interest as a scholarship student at Harvard College. After an heroic stint as a naval officer during World War II, Tobin returned to Harvard to complete his Ph.D. and joined the Yale faculty in 1950, where he later became Sterling Professor of Economics.

Tobin's dedicated teaching of undergraduate and graduate students spanned nearly four decades. Former students recall his incisive gaze as he explored new concepts with them and the gleam in his eye when they showed their understanding. Of the classroom Tobin once wrote, "I like teaching, and I do a lot of it. I never fail to learn, from the students themselves and from the discipline of presenting ideas clearly to them."

Professor Tobin directed the Cowles Foundation for Research in Economics from the time of its establishment at Yale in 1955 until 1961 and then again from 1964 to 1965. The Cowles Foundation, named for Yale graduate Arthur Cowles, is dedicated to the conduct of research in economics with particular emphasis on the development and application of mathematical and statistical methods of analysis. Tobin's contribution to the Cowles Foundation, considered to be one of the most productive research centers in academia, was focused in the areas of macroeconomics and monetary theory.

In 1961 and 1962 Tobin took leave from Yale to serve on President John Kennedy's Council of Economic Advisers. Tobin initially resisted the appointment, explaining to Kennedy that he was an "ivory tower economist." Kennedy replied, "That's all right,



James Tobin

professor. I am what you call an ivory tower president." After Tobin returned to Yale, he was an active consultant to the Council for several years.

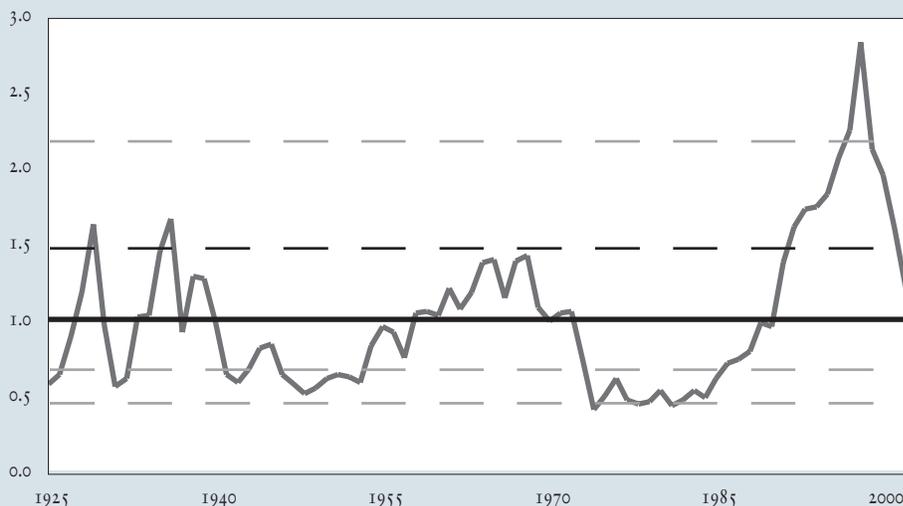
Among Tobin's many legacies in the field of economics are his contributions to finance theory, including Tobin's q , a quantifiable measure of the relationship between an asset's market value and its intrinsic value. In the context of equity markets, q relates the market value of a firm to the replacement cost of its assets. When market value exceeds replacement cost, resulting in a q greater than one, business investment is stimulated. When replacement cost exceeds market value, resulting in a q below one, firms will

tend to acquire companies rather than spend on new equipment. Tobin's q became especially pertinent during the excesses of the U.S. stock market in the late 1990s, as measures of q for dot-com stocks climbed to levels in excess of 100. New dot-com stocks were valued at hundreds of millions of dollars, even though they cost only a few million dollars to create, explaining their prolific rise in number. This period in the markets shocked Tobin, who believed that the equilibrium level of q should be approximately one and that market forces would limit movements away from that value.

Tobin played an important role in the development of the principles underlying mean-variance analysis. In fact, Harry Markowitz, whose name is most closely associated with portfolio optimization, used to refer to Tobin as the "father of mean-variance analysis" until Tobin with characteristic modesty asked Markowitz to stop. Tobin developed the separation theorem and showed how to increase the opportunity set available to investors by using combinations of an efficient portfolio of risky assets and the risk-free asset. By choosing one of the combinations, arrayed along what Tobin called the Capital Market Line, investors create portfolios superior to those that contain only risky assets.

Tobin's contributions to portfolio theory had a practical side as well. In the late 1980s, along with Yale

Tobin's q for U.S. Equities 1925–2002



Data as of September 2002. Tobin's q normalized to average one. Dashed lines represent one and two standard deviations around the normalized ratio of one.

professors William Brainard, William Nordhaus, Robert Shiller, Burton Malkiel, Stephen Ross, Roger Ibbotson, and William Goetzmann, Tobin worked with David Swensen and Dean Takahashi of the Yale Investments Office to review the application of mean-variance optimization and Monte Carlo simulation techniques to the challenges of managing Yale's Endowment. The framework developed at that time still serves the University as an important tool in developing policy asset allocation portfolios.

One of Tobin's papers, *What Is Permanent Endowment Income*, provided a formula for the sustainable consumption of endowment income, ensuring preservation of equity among generations. Tobin wrote that endowment consumption should be structured such that the "existing endowment can continue to support

the same set of activities that it is now supporting" and that "current consumption should not benefit from the prospects of future gifts to the endowment." He argued that consumption may rise to encompass an enlarged scope of activities when, but not before, capital gifts enlarge the endowment. Using the principles set forth in this paper, Tobin contributed to the design of the smoothing, inflation-sensitive spending rule that Yale uses to link the Endowment to the University's annual budget.

The Yale community's respect and gratitude for Tobin's contributions to the University are expressed in part by the endowment funds established in his name. The James Tobin Fund for Graduate Studies in Economics, established by a group of donors subsequent to Professor Tobin's death, grants scholarships to PH.D. candidates

in economics, allowing the department to recruit the very best graduate students. The Tobin-Okun-Phelps Research Fund, established in 1983 by donor Seong Yawng Park ('61 M.A., '65 PH.D.), supports research by junior faculty and advanced graduate students at the Cowles Foundation. The James Tobin Professorship, created in 1993 through an anonymous gift, provides financial support and prestige to the holder of the endowed chair. Since 1994 the position has been filled by Professor John Geanakoplos, who in addition to teaching students and conducting research currently serves as director of the Cowles Foundation. Although James Tobin can no longer add to his impressive legacy of teaching and scholarship, the endowments established in his name will continue to touch the lives of Yale scholars forever.

Despite recognizing that the U.S. equity market is highly efficient, Yale elects to pursue active management strategies, aspiring to outperform market indices by a few percentage points annually. Because superior stock selection provides the most consistent and reliable opportunity for generating excess returns, the University favors managers with exceptional bottom-up fundamental research capabilities. Managers searching for out-of-favor securities often find stocks that are cheap in relation to current fundamental measures such as book value, earnings, or cash flow. Yale's managers tend to emphasize small-capitalization stocks, as they are less efficiently priced and offer greater opportunities to add value through active management. Recognizing the difficulty of outperforming the market on a consistent basis, Yale searches for exceptional managers with high integrity, sound investment philosophies, strong track records, superior organizations, and sustainable competitive advantages.

Fixed Income

Fixed income assets generate stable flows of income, providing greater certainty of nominal cash flow than any other Endowment asset class. The bond portfolio creates substantial diversification for the Endowment, having a low covariance with other asset classes, and provides a hedge against financial accidents or periods of unanticipated deflation. While educational institutions maintain a substantial allocation to domestic bonds and cash, averaging 25.9 percent, Yale's target allocation to fixed income is a relatively low 10.0 percent of the Endowment. Bonds have an expected real return of 2.0 percent with risk of 10.0 percent. The Lehman Brothers U.S. Treasury Index serves as the portfolio benchmark.

Yale is not particularly attracted to fixed income assets, as they have the lowest historical and expected returns of the six asset classes comprising the Endowment. In addition, the government bond market is arguably the most efficiently priced asset class, offering few opportunities to add significant value through active management. Based on skepticism of active fixed income strategies and belief in the efficacy of a highly structured approach to bond portfolio management, the Investments Office chooses to manage Endowment bonds internally. In spite of an aversion to market timing strategies, credit risk, and call options, Yale manages to add value consistently in its management of the bond portfolio. Willingness to accept illiquidity leads to superior investment results without impairing the portfolio protection characteristics of high quality fixed income.

Foreign Equity

Investments in overseas markets give the Endowment exposure to the global economy, providing diversification along with opportunities to earn above-market returns through active management. Emerging markets, with their rapidly growing economies, are particularly intriguing, causing Yale to target one-half of its foreign portfolio to developing countries. Yale's foreign equity target allocation of 12.5 percent stands somewhat below the average endowment's allocation of 13.4 percent. Expected real returns for emerging equities are 8.0 percent with a risk level of 30.0 percent, while developed equities are expected to return 6.0 percent with risk of 20.0 percent. The portfolio is measured against a composite benchmark of 50 percent developed markets, measured by the Morgan Stanley Capital International (MSCI) Europe, Australia, and Far East Index, and 50 percent emerging markets, measured by the MSCI Emerging Markets Free Index.

Yale's investment approach to foreign equities emphasizes active management designed to uncover attractive opportunities and exploit market inefficiencies. As in the domestic equity portfolio, Yale favors managers with strong bottom-up fundamental research capabilities. Capital allocation to individual managers takes into consideration the country allocation of the foreign equity portfolio, the degree of confidence Yale possesses in a manager, and the appropriate asset size for a particular strategy. In addition, Yale attempts to exploit compelling undervaluations in countries, sectors, and styles by allocating additional capital and, perhaps, by hiring new managers to take advantage of the opportunities.

Absolute Return

In July 1990, Yale became the first institutional investor to pursue absolute return strategies as a distinct asset class, beginning with a target allocation of 15.0 percent. Designed to provide significant diversification to the Endowment, absolute return investments seek to generate high long-term real returns by exploiting market inefficiencies. Approximately half of the portfolio is dedicated to event-driven strategies, which rely on a very specific corporate event such as a merger, spin-off, or bankruptcy restructuring to achieve a target price. The other half of the portfolio contains value-driven strategies, which involve hedged positions in assets or

securities that diverge from underlying economic value. Today, the absolute return portfolio is targeted to be 25.0 percent of the Endowment. In contrast, the average educational institution allocates only 11.7 percent of assets to such strategies. Absolute return strategies are expected to generate real returns of 6.0 percent with risk levels of 10.0 percent for event-driven strategies and 15.0 percent for value-driven strategies.

Unlike traditional marketable securities, absolute return investments provide returns largely independent of overall market moves. Over the past ten years, the portfolio exceeded expectations, returning 12.1 percent per year with essentially no correlation to domestic stock and bond markets.

An important attribute of Yale's investment strategy is the alignment of interests between investors and investment managers. To that end, absolute return accounts are structured with performance-related incentive fees, hurdle rates, and clawback provisions. In addition, managers invest a significant portion of their net worth alongside Yale, enabling the University to avoid many of the pitfalls of the principal-agent relationship.

Private Equity

Private equity offers extremely attractive long-term risk-adjusted return characteristics, stemming from the University's strong stable of value-added managers that exploit market inefficiencies. Yale's private equity investments include participations in venture capital and leveraged buyout partnerships. The University's target allocation to private equity of 17.5 percent and its actual allocation of 14.4 percent both far exceed the 5.5 percent actual allocation of the average educational institution. In aggregate, the private equity portfolio is expected to generate real returns of 12.0 percent with risk of 30.0 percent.

Yale's private equity program, one of the first of its kind, is regarded as among the best in the institutional investment community. The University is frequently cited as a role model by other investors pursuing this asset class. Since inception, private equity investments have generated a 31.4 percent annualized return to the University. The success of Yale's program led to a 1995 Harvard Business School case study—"Yale University Investments Office"—by Professors Josh Lerner and Jay Light. The popular case study was updated in 1997 and 2000.

Yale's private equity assets concentrate on partnerships with firms that emphasize a value-added approach to investing. Such firms work closely with portfolio companies to create fundamentally more valuable entities, relying only secondarily on financial engineering to generate returns. Investments are made with an eye toward long-term relationships—generally, a commitment is expected to be the first of several—and toward the close alignment of the interests of general and limited partners. Yale avoids funds sponsored by financial institutions because of the conflicts of interest and staff instability inherent in such situations.

Foreign Equity

Foreign equities, with a target allocation of 12.5 percent of Endowment assets, provide substantial diversification to Yale's portfolio. Because forces that drive markets differ from country to country, market returns will vary from one country to another. This diversification, quantitatively reflected in the foreign equity portfolio's expected correlation of 0.5 to domestic equities, reduces overall portfolio risk.

Additionally, the large volume of companies listed in foreign markets and the inefficiencies in their pricing create opportunities to earn above-market returns through active management.

Yale looks for foreign equity managers that concentrate on creating portfolios using bottom-up stock selection rather than top-down macro considerations. Small-capitalization stocks, lying below the radar screen of large institutional funds, offer particularly compelling opportunities to add value. Although some of Yale's managers have global mandates, Yale recognizes that regional mandates facilitate the conduct of intensive company research, creating an edge over less focused global funds.

Country allocations heavily influence overall performance in foreign equities. Unfortunately, forecasting country returns proves difficult in developed markets and provides a generally unreliable source of value added. In emerging markets, country valuations sometimes move to extremes that offer identifiable top-down opportunities to generate excess returns. In general, however, Yale's managers focus on identifying bottom-up security-specific investments.

Yale allocates one-half of its foreign equity portfolio to emerging markets, where managers are particularly apt to find attractive investment opportunities. Emerging markets tend to be less efficient than developed markets, a consequence of illiquidity, little research coverage, and relatively unsophisticated local investors. Emerging markets also provide an expanded set of investment opportunities, with a large number of companies well positioned to benefit from rapidly growing and changing economies. Given expectations of powerful underlying economic growth and greater opportunities to find undervalued stocks, developing countries

provide an attractive arena for active management.

The Investments Office monitors the size of actively managed portfolios, shifting capital to take advantage of tactical opportunities. Capital allocation to individual managers takes into consideration the degree of confidence Yale possesses in a manager, the country allocation of the foreign equity portfolio, and the appropriate size for a particular strategy.

Although Yale's foreign equity managers fulfill a broad range of investment mandates, they share a commitment to fundamental research. In the developed portfolio, Yale has core allocations to managers that search for undervalued securities, employing proprietary models to identify value. Investment approaches range from using highly sophisticated quantitative modeling techniques, to buying "good companies at fair prices and fair companies at good prices," to identifying out-of-favor, asset-rich companies at deep discounts to fair value.

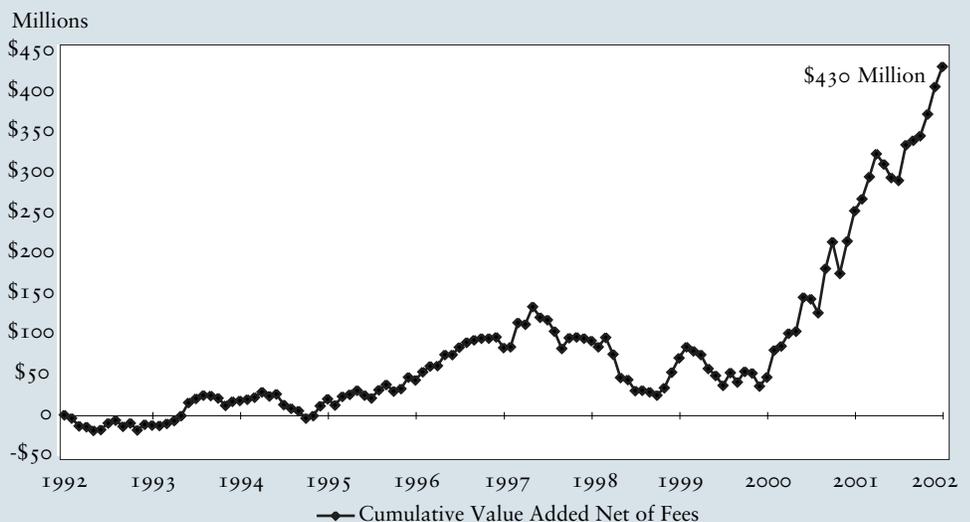
In the developing markets portfolio, in addition to managers that invest in emerging markets globally, Yale employs managers with regional concentrations in Eastern Europe, Russia, Latin America, Asia, and Africa. Such managers use thorough fundamental research to understand potentially attractive companies, often making hundreds of company visits per year.

Yale also manages internally a portfolio of closed-end funds and investment trusts that contain both developed and emerging market equities. Through these vehicles the University can increase or decrease exposure to foreign markets as needed and add incremental value by purchasing at wide discounts and selling at narrower discounts.

In general, Yale's managers do not hedge currency exposure, since currency positions are not expected to add value, improve diversification, or reduce risk to an extent that would justify their costs. With only 12.5 percent of the Endowment exposed to foreign currencies, Yale's exchange rate risks are of relatively small consequence. In fact, modest foreign currency exposure can improve diversification, providing a welcome hedge against domestic inflation or economic weakness.

The University's performance in foreign equities has been outstanding, both in the short term and over longer periods. Yale's returns in this asset class make a strong case for active management, since the University has fared well despite lackluster returns in global indices. Over the ten years ending June 30, 2002, Yale foreign equities returned 9.3 percent per annum, nearly twice the annualized 4.7 percent return of the asset class's composite benchmark. This solid performance generated \$430 million in value added relative to the portfolio's benchmark.

Foreign Equities Add Value Relative to Composite Benchmark 1992–2002



Real Assets

Real estate, oil and gas, and timberland share common characteristics: sensitivity to inflationary forces, high and visible current cash flow, and opportunity to exploit inefficiencies. Real asset investments provide attractive return prospects, excellent portfolio diversification, and a hedge against unanticipated inflation. Yale's 20.0 percent long-term policy allocation significantly exceeds the average endowment's commitment of 3.2 percent. Expected real returns are 6.0 percent with risk of 15.0 percent.

The real assets portfolio plays a meaningful role in the Endowment as a powerful diversifying tool and a generator of strong returns. Real assets provide relative stability to the Endowment during periods of public market turmoil, at the price of an inability to keep pace during bull markets. Pricing inefficiencies in the asset class and opportunities to add value allow superior managers to generate excess returns over a market cycle. Since inception in 1978 the portfolio has returned 15.0 percent per annum.

The illiquid nature of real assets combined with the expensive and time-consuming process of completing transactions creates a high hurdle for casual investors. Real assets provide talented investment groups with the opportunity to generate strong returns through savvy acquisitions and managerial expertise. A critical component of Yale's investment strategy is to create strong, long-term partnerships between the Investments Office and its investment managers. In the last decade Yale played a critical role in the development and growth of more than a dozen organizations involved in the management of real assets.

Asset Allocations

	Yale University	Educational Institution Mean
Domestic Equity	15.4%	39.3%
Fixed Income	10.0	22.9
Foreign Equity	12.8	13.4
Absolute Return	26.5	11.7
Private Equity	14.4	5.5
Real Assets	20.5	3.2
Cash	0.3	3.0

Data as of June 30, 2002.

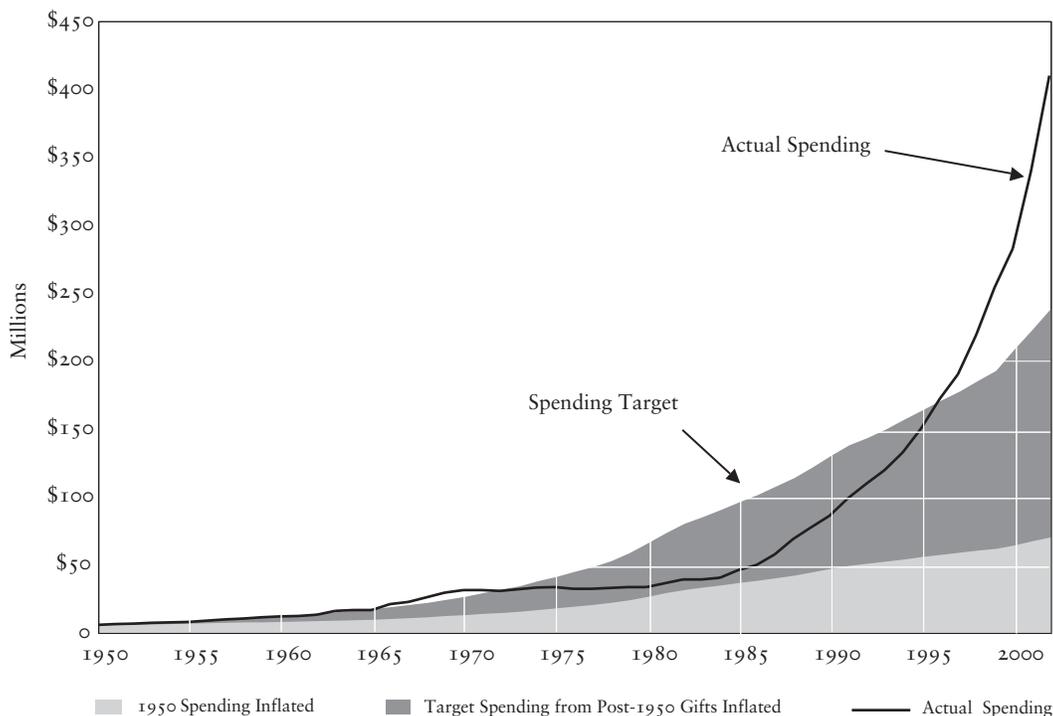
4

The spending rule is at the heart of fiscal discipline for an endowed institution. Spending policies define an institution’s compromise between the conflicting goals of providing substantial, sustainable support for current operations and preserving purchasing power of Endowment assets. The spending rule must be clearly defined and consistently applied for the concept of budget balance to have meaning.

Yale’s policy is designed to meet two competing objectives. The first is to release substantial current income to the operating budget in a stable stream, since large fluctuations in revenues are difficult to accommodate through changes in University activities or programs. The second is to protect the value of Endowment assets against inflation, allowing programs to be supported at today’s level far into the future.

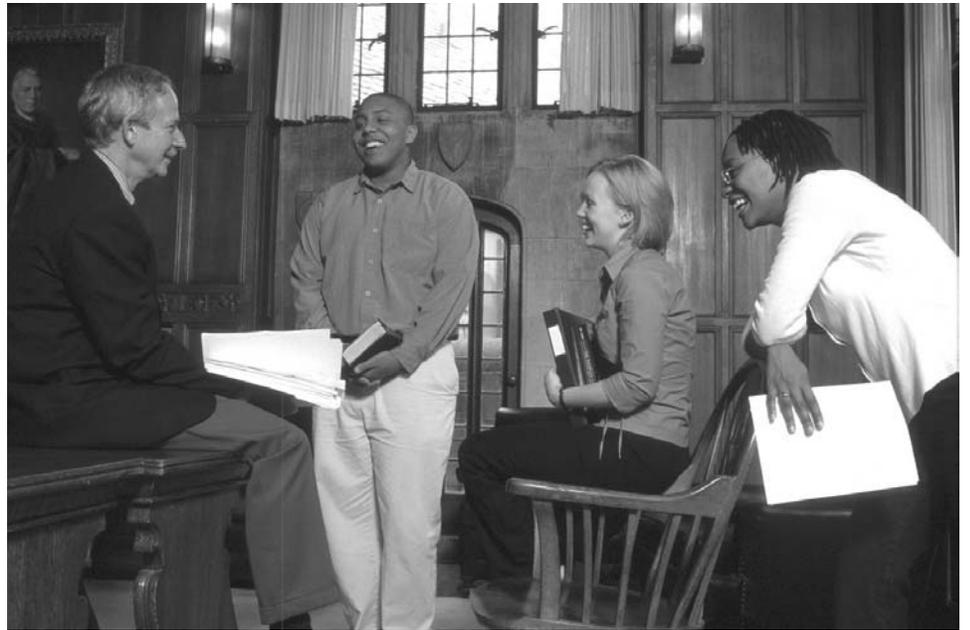
Yale’s spending rule attempts to achieve these two objectives by using a long-term spending rate of 5 percent combined with a smoothing rule that adjusts spending gradually to changes in Endowment market value. The amount released under the spending rule is based on a weighted average of prior spending adjusted for inflation (70 percent weight) and the amount that would have been spent using 5 percent of current Endowment market value (30 percent weight).

Spending Growth Outpaces Inflation 1950–2002



The spending rule has two implications. First, by incorporating the previous year's spending the rule eliminates large fluctuations, enabling the University to plan for its operating budget needs. Over the last twenty years, annual changes in spending have been less than a third as volatile as annual changes in Endowment value. Second, by adjusting spending toward the long-term rate of 5 percent of Endowment, the rule ensures that spending levels will be sensitive to fluctuating Endowment market value levels, providing stability in long-term purchasing power.

Spending from the Endowment increased at a hearty pace during the past decade despite the conservative nature of Yale's spending policy, with distributions rising from \$108 million in fiscal 1992 to \$409 million in fiscal 2002. Consequently, Endowment spending plays an ever-greater role in the budget, having risen from 13 percent of expenditures in 1992 to 28 percent in 2002.



Dean Richard H. Brodhead, A. Bartlett Giamatti Professor of English, meets with Yale College students. Endowed faculty chairs and other teaching endowments help the University to attract and retain outstanding faculty.



Endowed scholarship funds are essential to ensuring that Yale continues to attract the finest students, regardless of ability to pay.

Investment Performance

5

Performance by Asset Class

Yale has produced excellent investment returns. Over the ten-year period ending June 30, 2002, the Endowment earned an annualized 16.9 percent return, net of fees, placing it in the top one percent of large institutional investors. Endowment outperformance is attributable to sound asset allocation policy and superior active management.

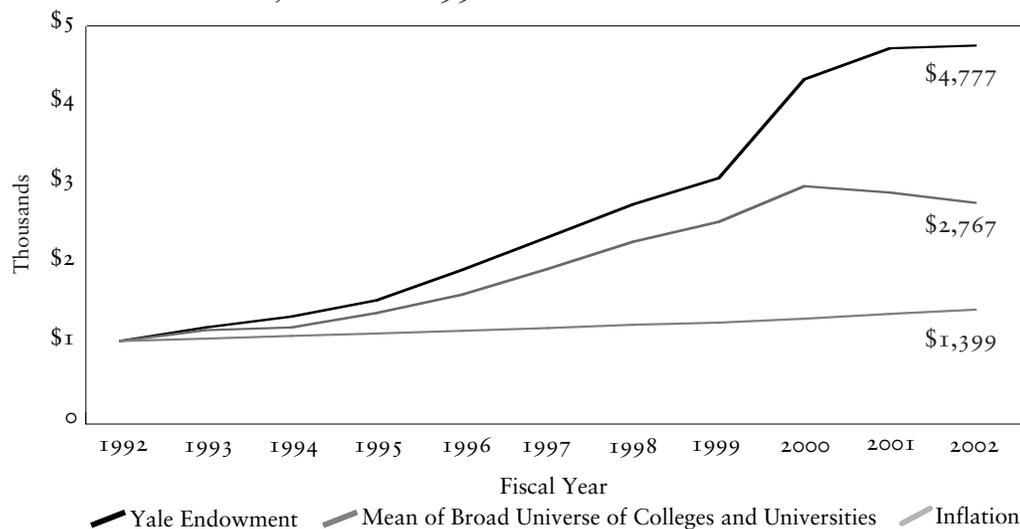
Yale's long-term superior performance relative to its peers and benchmarks created substantial wealth for the University. Over the ten years ending June 30, 2002, Yale added \$4.7 billion relative to its composite benchmark and an estimated \$5.1 billion relative to the average return of a broad universe of college and university endowments.

Yale's long-term asset class performance continues to be strong. In the past ten years every asset class posted superior returns, in all cases outperforming benchmark levels.

For the decade ending June 30, 2002, the domestic equity portfolio returned an annualized 16.9 percent, outperforming the Wilshire 5000 by 5.8 percent per year. Active managers have added value to benchmark returns primarily through stock selection.

Yale's internally managed fixed income portfolio earned an annualized 8.2 percent over the past decade, outpacing the Lehman Brothers Government Bond Index by 0.9 percent per year. By making astute security selection decisions and accepting illiquidity, the Endowment benefited from excess returns without incurring material credit or option risk.

Relative Investment Performance of the Yale Endowment
Growth of \$1,000 from 1992 to 2002



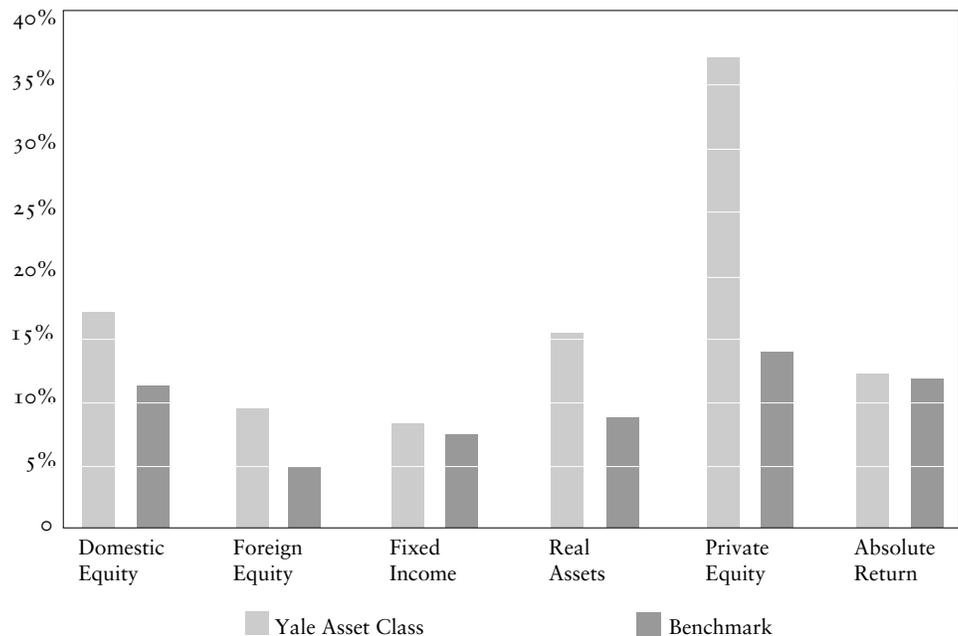
Over the past decade, the absolute return portfolio has produced an annualized 12.1 percent, exceeding its benchmark of University inflation plus 8.0 percent by 0.4 percent per year. Absolute return results exhibited essentially no correlation to traditional marketable securities.

The foreign equity portfolio generated an annual return of 9.3 percent over the ten-year period, outperforming its composite benchmark by 4.6 percent per year. The portfolio's excess return is due to effective security selection and country allocation by active managers.

Results from Yale's non-marketable assets demonstrate the value of effective active management. Private equity earned 36.9 percent annually over the last ten years. Since inception in 1973, the private equity program has earned an astounding 31.4 percent per annum.

Real assets generated a 15.3 percent annualized return over the ten-year period, outperforming its benchmark, currently University inflation plus 6.0 percent, by 6.7 percent per year. Yale's outperformance is due to the successful exploitation of market inefficiencies and timely pursuit of contrarian investment strategies.

Asset Class Returns Relative to Benchmarks
1992-2002



Annualized returns net of fees.
Real assets consists only of real estate prior to 1999.

Management and Oversight

6

Since 1975, the Yale Corporation Investment Committee has been responsible for oversight of the Endowment, incorporating senior-level investment experience into portfolio policy formulation. The Investment Committee consists of at least three Fellows of the Corporation and other persons who have particular investment expertise. The Committee meets quarterly, at which time members review asset allocation policies, Endowment performance, and strategies proposed by Investments Office staff. The Committee approves guidelines for investment of the Endowment portfolio, specifying investment objectives, spending policy, and approaches for the investment of each asset category. Thirteen individuals currently sit on the Committee.

Investment Committee

Charles D. Ellis '59, Chairman
*Former Managing Partner
Greenwich Associates*

Herbert M. Allison, Jr. '65
*Chairman, President, and
Chief Executive Officer
Teachers Insurance and Annuity
Association and College Retirement
Equities Fund (TIAA-CREF)*

G. Leonard Baker '64
*Managing Director
Sutter Hill Ventures*

Joshua Bekenstein '80
*Managing Director
Bain Capital*

Robert L. Culver
*Vice President for Finance
and Administration
Yale University*

Holcombe T. Green, Jr. '61
*Principal
Green Capital Investors, L.P.*

Richard C. Levin '74 PH.D.
*President
Yale University*

Jane L. Mendillo '80, '83 M.B.A.
*Chief Investment Officer
Wellesley College*

William I. Miller '78
*Chairman
Irwin Financial Corporation*

Indra K. Nooyi '80 M.P.P.M.
*President and Chief Financial Officer
PepsiCo, Inc.*

Theodore P. Shen '66
*Former Chairman
DLJ Capital Markets*

John L. Thornton '80 M.P.P.M.
*President and
Co-Chief Operating Officer
Goldman Sachs International*

Douglas A. Warner III '68
*Former Chairman of the Board
J.P. Morgan Chase & Co.*

The Investments Office manages the Endowment and other University financial assets, and defines and implements the University's borrowing strategies. Headed by the Chief Investment Officer, the Office currently consists of sixteen professionals.

Investments Office

David F. Swensen '80 PH.D.
Chief Investment Officer

Randy Kim '98
Senior Associate

Dean J. Takahashi '80, '83 M.P.P.M.
Senior Director

Celeste P. Benson
Senior Portfolio Manager

Seth D. Alexander '95
Director

Shuba V. Raghavan
Senior Research Associate

Alexander C. Banker
Director

Robert F. Wallace '02
Senior Financial Analyst

Alan S. Forman
Director

Ana Yankova
Senior Financial Analyst

Timothy R. Sullivan '86
Director

Jay L. Kang '02
Financial Analyst

Kenneth R. Miller '71
Associate General Counsel

Kimberly B. Sargent '00
Financial Analyst

Michael E. Finnerty
Associate Director

David B. Slifka '01
Financial Analyst



South courtyard in Berkeley College.

Science and Technology at Yale

In the early decades of Yale College's existence, the curriculum was dominated by theology and classics, with natural science playing a secondary role. The first generations of Yale students did take a course in "natural philosophy"—a mixture of biology, geology, astronomy, and physics—although their textbooks would have been out of date even before the College was founded.

Science was not the only subject to be subordinated to other pursuits in Yale's early years. English language and literature were not introduced until a full half-century after the founding of the College. In 1776, the Corporation finally offered a course in history, rhetoric, and "belles lettres" as an extra subject for students who had obtained permission from their parents.

Yale began to make strides in the sciences in the 19th century. "Considering the hesitation with which English universities recognized the study of nature as their concern," one prominent alumnus stated in 1901, "it is well to remember how early science came into the Yale curriculum, and how steadily it has held its place." Indeed, a faculty chair of mathematics, physics, and astronomy was instituted at Yale thirty years before the professorship of ancient languages.

In a momentous move in 1847, Yale established the Department of Philosophy and the Arts, which introduced a broader science curriculum and formalized graduate education in scientific subjects. The department had only eleven students in its first year, with so little financial backing that Professor Benjamin Silliman, Jr. used his own funds to rent space for laboratories. In spite of its humble beginnings, the department was responsible for the founding of a new school of science in 1852, which offered instruction in chemistry, mineralogy, geology, astronomy, calculus, analytical mechanics, psychology, and agricultural science, along with non-science subjects. The institution incorporated engineering into its curriculum soon thereafter, offering not only civil engineering but also "dynamic" (mechanical) engineering, a subject in which the school was a pioneer.

An important development for the school of science occurred in 1855 when chemistry Professor John A.

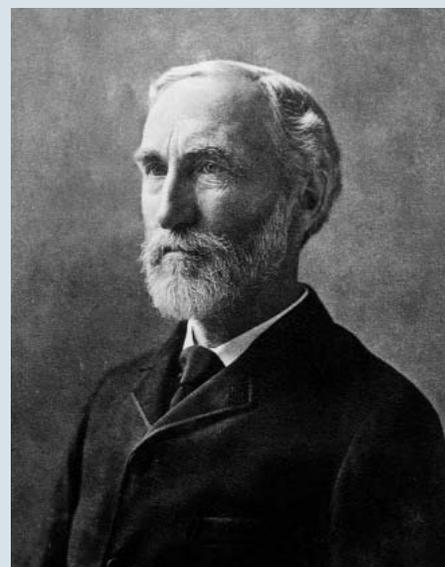


Joseph E. Sheffield

Porter married the daughter of a wealthy New Haven financier, Joseph E. Sheffield. Sheffield generously provided buildings and temporary funding for salaries in engineering, metallurgy, and chemistry. The school acknowledged him by taking his name in 1861. Sheffield's bequest, which included his home on Hillhouse Avenue, brought his lifetime gifts to a total of \$1.1 million, a sum that would remain a Yale record until the 20th century. Despite Sheffield's munificence, endowed support for the teaching of the sciences was slow to develop.

The Sheffield Scientific School, also known as "Sheff," remained distinct from Yale College until well into the 20th century. While Yale College continued to offer a fixed program of liberal arts and a smattering of sciences, Sheff provided a more flexible curriculum. Yale students and Sheff students led separate lives. No housing was provided for Sheff students, chapel attendance was not required, and the course of study lasted only three years. Because students of one school could not take courses in the other, there was some duplication of curriculum and of facilities; each school, for instance, maintained its own chemistry and physics laboratories. It was not until 1909, when a common physics laboratory was built, that Yale students would begin the trek up "Science Hill."

In 1880, Yale learned an important lesson about competition in the natural sciences and the importance of endowed



Josiah Willard Gibbs, Jr.

faculty support. At that time Yale College was fortunate to have on its faculty as professor of mathematical physics the brilliant Josiah Willard Gibbs, Jr. (1838, 1863 PH.D.) who has been called "the greatest scholar Yale has ever produced or harbored."

Gibbs, the author of groundbreaking works on thermodynamics that remain authoritative even today, joined the Yale faculty in 1871 without salary. For nine years Professor Gibbs raised no objection to his lack of pay, even when Bowdoin College offered him a salaried position in 1873. The Yale administration seemed unaware of the extent to which the institution was taking this important scientist for granted.

In 1880, when Johns Hopkins attempted to hire Gibbs for a salary of \$3,000, Yale finally made a counter-offer. It would be unthinkable today for an institution to try to retain a member of its faculty by offering two-thirds of a competitor's bid. But that is what Yale did, and, to the relief of many, Gibbs accepted the \$2,000 along with the promise to secure an endowment to fund his salary as well as future increases. Yale's problem was not disregard for Gibbs, but the University's relative poverty. The institution had been trying to improve its offerings in laboratory science, or what it still called "natural philosophy." In 1880, however, it had only three endowed professorships in the fields of science and mathematics.

Historic contributions from John W. Sterling (1864) of approximately \$40 million and Edward S. Harkness (1897) of nearly \$16 million proved crucial to the sciences at Yale. The building of residential colleges, thanks to Harkness funding, brought Sheff and Yale College students under the same roof as participants in a common undergraduate culture. Sterling funds created facilities such as the central library and the new chemistry laboratory that would serve Sheff and Yale College students alike. The trend toward integration would soon spell the end of the Sheffield Scientific School. In 1956 Sheff ceased operation as a separate entity, and its endowment merged into the University's funds.

Yale's expenses rose steadily after World War II and the Endowment suffered. Fortunately, the growth of an important new source of revenue filled the gap. Federal government grants and gifts, less than \$600,000 in 1950, increased thirtyfold by 1965, providing a tremendous benefit to the sciences. In 1960, the University launched a major fundraising campaign, "The Program for the Arts and Sciences," with emphasis on the latter. President Whitney Griswold asserted that Yale had been seriously neglecting the sciences for decades, just when "the advancement of scientific knowledge has been more rapid than at any other time since the scientific revolution of the 17th century."

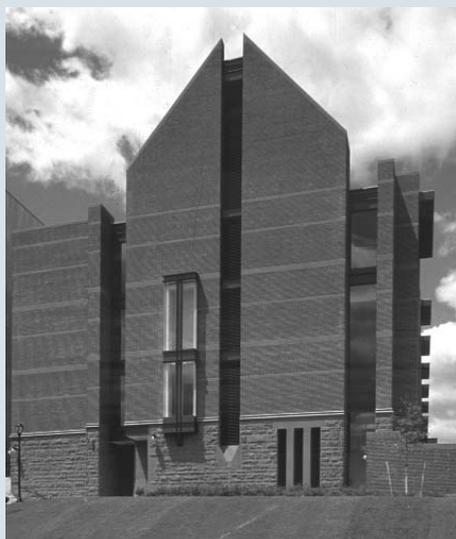


Class of 1954 Environmental Science Center, a laboratory and classroom facility on Sachem Street adjacent to the Peabody Museum of Natural History, opened in 2002.

In response to the campaign, a gift of \$10 million from C. Mahlon Kline (PH.B. 1901) launched a wave of construction that added Kline Biology Tower and Kline Geology Lab to Science Hill. Yale continued to improve its standing in the science disciplines, adding a department of computer science in 1970 and emphasizing new programs in the biological, health, and environmental sciences. In the late 1990s the University introduced new majors in biomedical engineering and environmental engineering.

Science and technology remain at the forefront of University planning today, evidenced by increased Endowment support for the sciences and the construction of new buildings. Recent

additions to the Science Hill landscape include the Nancy Lee and Perry R. Bass Center for Molecular and Structural Biology and the Class of 1954 Environmental Science Center, both of which enhance Yale's programs in newer disciplines. In January 2000, Yale President Richard Levin revealed the University's plans for a \$500 million construction program devoted entirely to engineering and the sciences. In announcing the program at the start of the new century, the President stated, "This ambitious plan for science and engineering is a crucial element in Yale's strategy to remain among the very small number of universities that are considered the finest in the world."



Nancy Lee and Perry R. Bass Center for Molecular and Structural Biology, atop Science Hill.



Yale undergraduates designed and built a solar-powered automobile, "Lux Perpetua," in the late 1990s.

Some Important Yale Endowments in the Sciences and Engineering

1851

Silliman Professorship Fund

Edward E. Salisbury (1832), Theodore D. Woolsey (1820), Alexander Duncan (1825), and Joseph Trumbull (1801) made a combined gift of over \$10,000 to create the Silliman Professorship of Natural History. The chair honored Benjamin Silliman, Sr. (1796), a notable professor of chemistry, mineralogy, pharmacy, and geology at Yale College. Professor Karl Turekian of the Department of Geology and Geophysics currently holds the chair.

1871

Joseph Earl Sheffield Fund

Joseph Earl Sheffield (1871 M.A.HON.), stating his concern for the need to fund salaries in the Sheffield Scientific School, made an endowment gift of \$50,000 that was earmarked for general purposes, including teaching. Mr. Sheffield also gave North Sheffield Hall and the land on which it stood, in addition to other buildings. Upon his death in 1882 he left the school one-seventh of his estate, bringing the sum of his contributions to more than \$1 million.

1920

Sterling Professorships Fund

The bequest of John William Sterling (1864) provided, in addition to \$23 million for buildings, some \$17 million to fund various endowments. Now worth more than \$300 million, the Sterling endowments support, among other things, 30 Sterling Professorships for Distinguished Faculty. Among those holding Sterling chairs are professors of biology, chemistry, mathematical sciences, and molecular biophysics and biochemistry.

1961

Edward Allen Colby Scholarship Fund

Annie W. Colby donated \$300,000 to establish an endowment in honor of her husband, Edward Allen Colby (1880 PH.B.). Now worth \$10 million, the fund provides grants to as many as 16 undergraduate students each year in the sciences.

1961

Henry Ford II Professorship Fund

The Henry Ford II Fund provided Yale with over \$1 million to endow professorships in the sciences, one of which supported the teaching of molecular biophysics, a relatively new subject for the University at the time. Current incumbents of Henry Ford II chairs include Professors Richard K. Chang, Department of Applied Physics, and Michael E. Zeller, Department of Physics.

1983

Arthur K. Watson Professorship Fund

A bequest of \$1.5 million from Arthur K. Watson ('42), who had distinguished himself as President of IBM World Trade Corporation, led to the establishment of a professorship in the Department of Computer Science, currently held by Professor Martin H. Schultz.

1995

Frederick W. Beinecke Chair in Engineering Fund

William S. Beinecke ('36, '71 M.A.HON., '86 LL.D.HON.) endowed a chair in engineering in honor of his father, Frederick W. Beinecke ('09S). Paul A. Fleury, Dean of the Faculty of Engineering, currently holds the chair.

1997

G. Evelyn Hutchinson Endowed Chair Fund

Edward P. Bass ('67, '72 ARCH.) endowed a professorship in the Institute for Biospheric Studies, to honor a distinguished Sterling Professor of Zoology. Mr. Bass's generous support also helped to establish the Institute for Biospheric Studies at Yale, and endow other faculty chairs and the directorship of the Peabody Museum of Natural History. Michael J. Donoghue is the current Hutchinson Professor of Ecology and Evolutionary Biology.

2000

Allen H. Ford '50 Biomedical Engineering Fund

To commemorate his 50th Yale College reunion, Allen H. Ford ('50) made a gift to support one of the newest Yale College majors, Biomedical Engineering.

Sources

Much of the material in this publication is drawn from memoranda produced by the Investments Office for the Yale Corporation Investment Committee. Other material comes from Yale's financial records, Reports of the Treasurer, and Reports of the President.

Pages 7-13

Average educational institution asset allocations from Cambridge Associates' *Analysis of College and University Investment Pool Returns, 2001-2002*.

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Graph of Tobin's *q* data from Grantham Mayo van Otterloo. Data from Federal Reserve Board.

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The Endowment's annual return for the ten years ending June 30, 2002 ranks in the top one percent of institutional funds as measured by the SEI Large Plan Universe.

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Michael Marsland, Yale Office of Public Affairs

Design

Strong Cohen