Frontier Investment Management

INVESTING LIKE THE HARVARD AND YALE ENDOWMENT FUNDS

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Introduction

The US University Endowment Funds ("US Endowment Funds"), such as Harvard and Yale, have been leaders in diversified multi-asset class investing for over two decades. Through this approach to investing and with a large exposure to alternative asset classes, they have consistently achieved attractive annual returns with moderate risk. This paper explores whether investors can benefit by applying these investment principles to their own portfolios.

The rationale for investing across multiple asset classes is supported by Modern Portfolio Theory. This theory, developed by Nobel Prize winner Harry Markowitz, demonstrates that the risk-adjusted returns of a portfolio can be improved by diversification across assets with varied correlations. Modern Portfolio Theory is at the heart of the investment philosophy of the Harvard and Yale University Endowment Funds, and is the foundation upon which their portfolios are constructed.

In their seminal study into the importance of asset allocation, Brinson, Hood & Beebower (1986)[1] and Ibbotson et al. (2000)[2] determined that the vast majority of the variability of a portfolio's returns emanated from the long-term or strategic asset allocation of the portfolio (Table 1). Therefore, an investor constructing an indexed portfolio with a similar asset allocation to the "Super Endowments" of Harvard and Yale should, in theory, achieve similar return/risk characteristics to these successful investors.

The US Endowment Funds are exceptionally well resourced and have access to the best fund managers and private equity programs, which contributes significantly to their investment success. However, in this paper we demonstrate that by adopting similar asset allocation principles, it is possible for smaller investors to obtain high levels of risk-adjusted returns for their own portfolios; superior to that of traditional equity/bond portfolios and to most balanced investment funds.

Table 1: Percentage of Return Explained by Asset Allocation[1,2]

Research	Brinson (1986)	Brinson (1991)	Ibbotson (1999)	Ibbotson (2000)
Percentage	94%	92%	81%	88%
Active Return	-1.1%	-0.1%	-0.3%	-0.4%

"...our analysis shows that asset allocation explains about 90% of the variability of a fund's returns over time. Furthermore, on average across funds, asset allocation policy explains a little more than 100% of the level of returns."

Roger G. Ibbotson and Paul D. Kaplan
The Financial Analysts Journal,
January/February 2000

"At Frontier, one significant input into the asset allocation of our multi-asset funds and model portfolios is the investment strategy and asset allocations of the large US University Endowment Funds. This short research article is intended to show why."

Michael Azlen
Founder and CIO
Frontier Investment Management

Overview

University Endowment Funds are non-taxable vehicles established to contribute towards the future funding requirements of the university. Their funding comes from a combination of legacies, gifts and investment returns. They employ an investment philosophy focused around diversification whilst taking advantage of a long term investment time horizon which allows them to invest a portion of capital in less liquid assets whilst also being tolerant of market volatility. This ensures the pursuit of long-term investment themes as opposed to reacting to short-term market movements.

In the US in 2015, there were 812 Endowments which represented $529 billion in combined assets; the largest fund being Harvard University with $37.6 billion under management[3].

Oxford and Cambridge

In the UK, University Endowment Funds are smaller in size. The Cambridge University Endowment Fund managed a total of £2.5 billion in 2015 whilst Oxford University's Endowment Fund managed £2.0 billion. Similar to the US Endowment Funds, the two UK Endowment Funds have a broad asset allocation which does not change by a large amount each year. However, the allocation to equities is markedly different with Cambridge having a 69% allocation to equities and Oxford a 70% allocation. This is in contrast to an average allocation of approximately 50% to equities (public and private) for most US Endowment Funds.[4]

Why Study the US Endowment Funds

Examining the strategies of the US Endowment Funds is of relevance to investors for the following reasons:

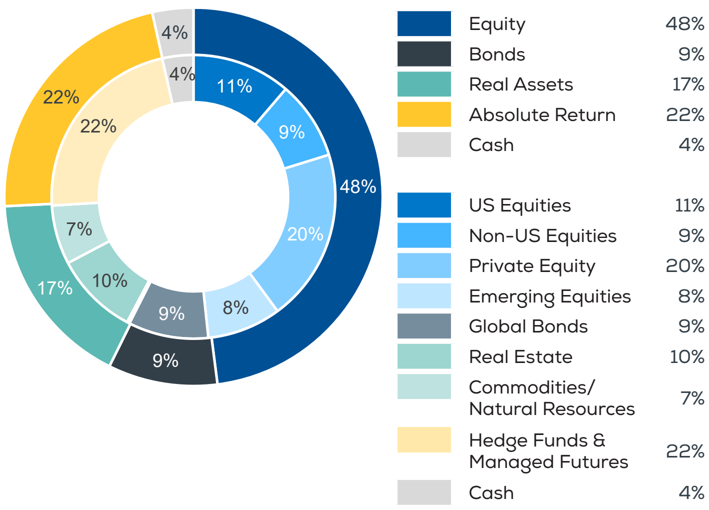
- US Endowment Funds have consistently achieved superior investment returns. This is especially the case for the "Super Endowments" of Harvard and Yale. They have achieved an average 20 year annualised return of 12.7% 4.8% greater than the returns of a traditional 60/40 US equity/bond portfolio (Table 2);
- US Endowment Funds have diverse portfolios with exposure to multiple asset classes including significant exposure to alternative asset classes. This emphasis on diversification provides inspiration for smaller investors looking to meet their own investment objectives at a time when many are looking at ways to diversify away from large bond holdings (Chart 1);
- US Endowment Funds have long-term investment horizons and stable, strategic asset allocations that rely less on market timing for generating returns.

This paper will focus on US Endowment Funds, assessing their current asset allocation as well as the relationship between investment performance, fund size and relative allocations to alternative asset classes. Following this, we will evaluate the performance of Endowment Index Portfolios, created by applying the average annual asset allocation of Harvard and Yale to a selection of indices. This will provide a robust means of assessing the merits of adopting an "endowment style" investment strategy as well as providing insight into the importance of strategic asset allocation as a driver of portfolio returns.

Table 2: US Endowment Funds relative to a Traditional Portfolio[3,5,8]

	Alternative Asset Allocation	15 year Returns (A)	20 year Returns (A)
US Equity/Bond Portfolio (60:40)	0%	5.1%	7.9%
Average US Endowment Fund	30%	5.1%	7.7%
Endowment Funds › $1bn	38%	6.8%	9.3%
Endowment Funds Top 5	45%	8.8%	N/A
Super Endowments (Harvard/Yale)	45%	9.4%	12.7%

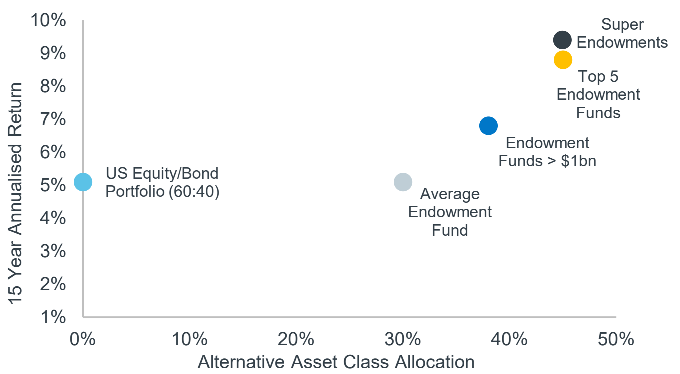
Chart 1: Asset Allocation of the top 20 US Endowment Funds 2015[6]



Endowment Asset Allocation

The average US Endowment Fund held roughly 70% in traditional asset classes (public and private equity, bonds and cash) with the remaining 30% invested in alternative assets. Comparatively, the largest 5 Endowments and the Super Endowments (in reference to their size) of Harvard and Yale held 55% in traditional asset classes with the remaining 45% allocated to alternatives. This additional diversification employed by the larger Endowment Funds is one of the reasons for their superior long-term investment performance. In particular, the larger Endowments have sizeable allocations to alternative asset classes such as real estate, commodities, natural resources and absolute return strategies which can be seen to be positively correlated with long-term performance (Chart 2).

Chart 2: 15 Year Returns and Alternative Allocations[3,5,6,7]



Super Endowments: Harvard and Yale

Frontier places particular emphasis on the asset allocation methodology of the 'Super Endowments' of Harvard and Yale. These funds have consistently been two of the better performing US Endowments with annual returns placing them in the top 10 of over 800 US Endowments in a majority of years. For the 15 years to June 2015 the annualised returns for Harvard and Yale were 8.2% and 10.6% respectively, greater than the vast majority of their peers and those of a traditional portfolio at 5.1% (Table 3).

The Harvard Endowment Fund is the largest at $37.6 billion whilst the Yale Endowment Fund is the second largest at $25.6 billion. These funds have been pioneers in multi-asset investing.

Like US Endowment Funds in general, the asset allocation of the Super Endowments has been very stable over time changing by an average of only 5% per year over the past fifteen years. A large part of this annual change is due to asset class price movements since the "target allocations" of these investors is stable, long term and strategic.

These stable allocations reflect their long-term investment horizons and willingness to remain invested throughout economic cycles. They generally do not seek to tactically time the markets.

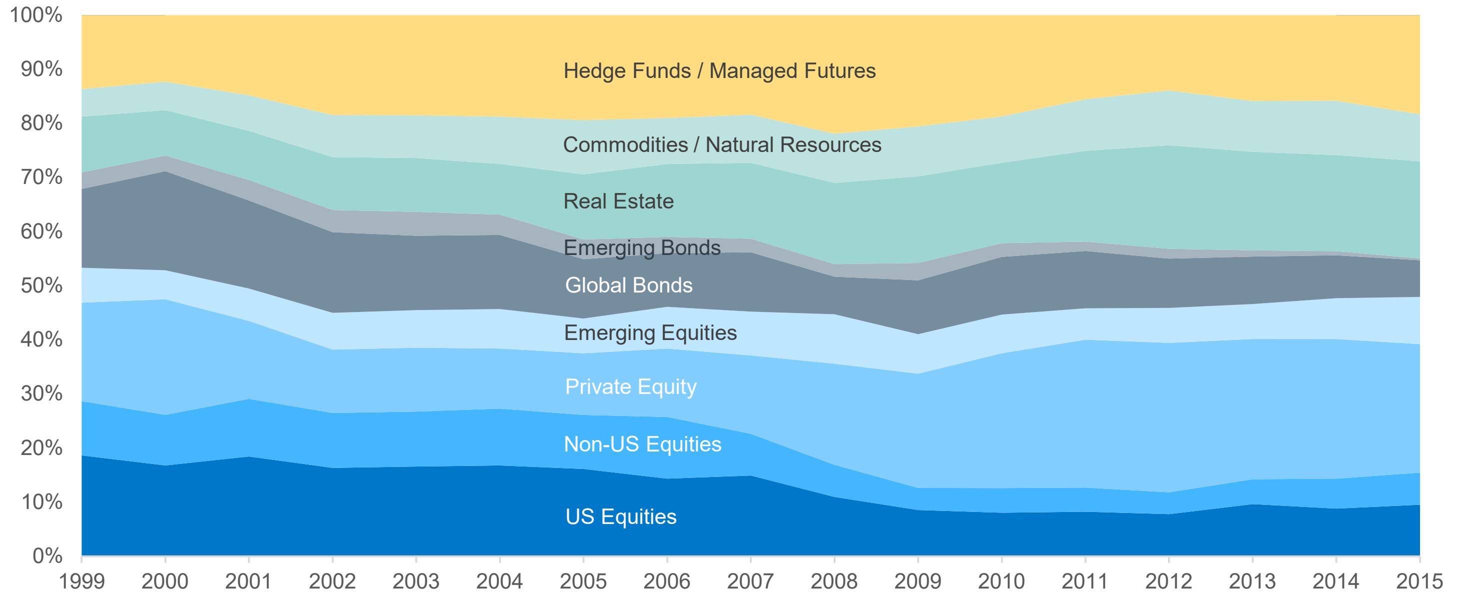
Table 3: Super Endowment Funds as at June 2015[5,6,7]

	Harvard	Yale	60:40 Equity/ Bond
Size ($ billion)	37.6	25.6	N/A
Annual Return 2014/15	5.8%	11.5%	5.3%
10 Yr Ann. Returns	7.6%	10.0%	6.8%
15 Yr Ann. Returns	8.2%	10.6%	5.1%
20 Yr Ann. Returns	11.8%	13.7%	7.9%
Manager	Stephen Blyth	David Swensen	-
Investment Style	Multi-Asset	Multi-Asset	Equity/Bond

"Substantial allocations to alternative assets offer a level of diversification unavailable to investors in traditional assets, allowing the creation of portfolios with superior risk and return characteristics."

David F. Swensen, CIO,
The Yale Endowment Report 2010

Chart 3: Super Endowments Asset Allocation over time[6]



2001		2015
49%	Equity	48%
20%	Bonds	8%
16%	Real Assets	28%
15%	Absolute Return	16%

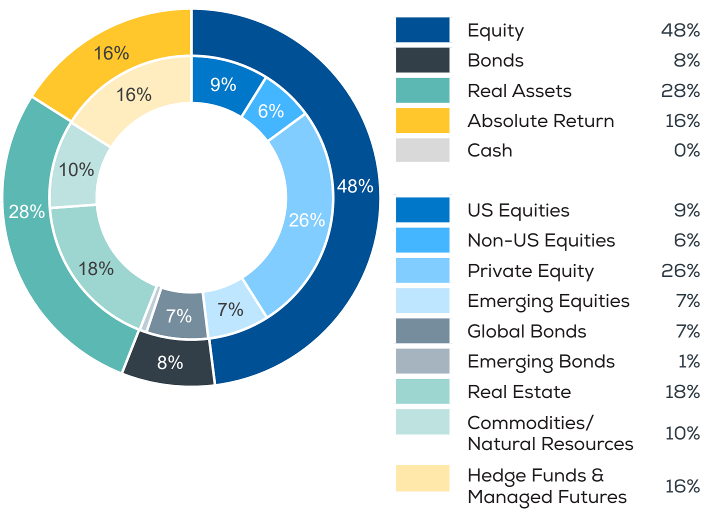
"The asset allocations of the Super Endowments have been very stable over-time changing by an average of only 5% per year over the past fifteen years."

Index Investing Using the Asset Allocations of the Super Endowments

The superior returns, long term investment horizons, and stable asset allocations of the Super Endowment Funds make benchmarking to their asset allocations attractive. Academic research by Gary Brinson and Robert Ibbotson et al has confirmed that the strategic asset allocation of a portfolio is the dominant driver of both return and risk (Table 1).

In this paper, we create an Endowment Index Portfolio ("EIP") that applies a Super Endowment asset allocation to a set of inidces. This will allow us to determine whether a multi-asset portfolio is able deliver superior risk-adjusted returns relative to a traditional portfolio. We also create a second EIP that substitutes an investable proxy index for the Cambridge Associates Private Equity Index (non-investable), in line with the rest of the EIP.

Chart 4: Endowment Index Portfolio 2015 Asset Allocation



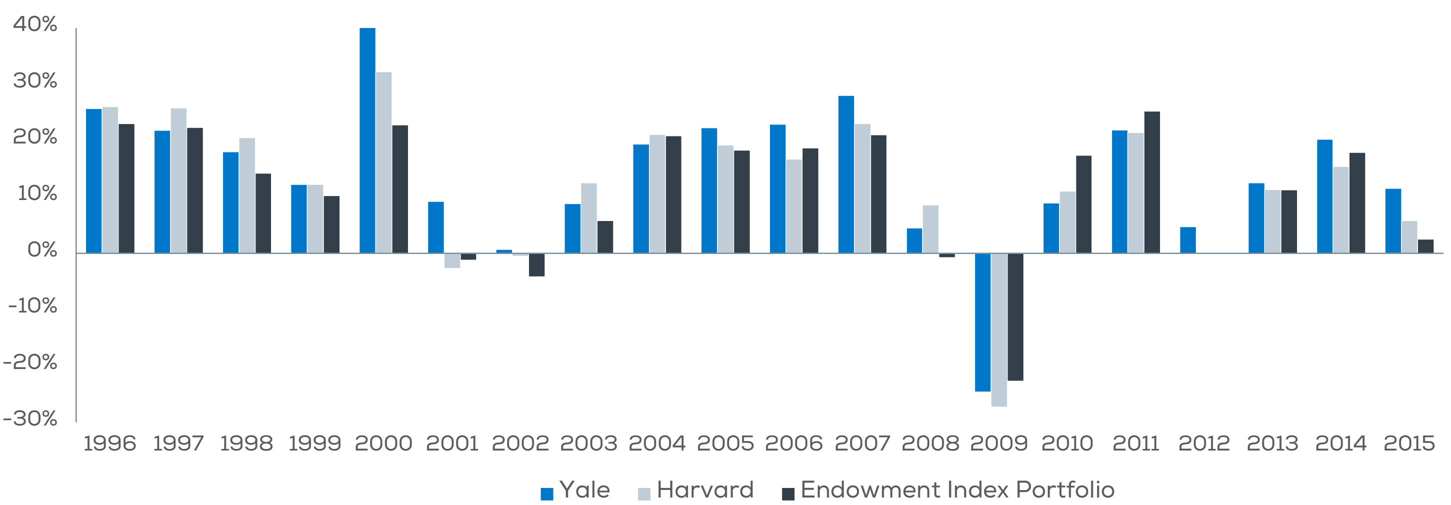
Methodology

The first step was to take the average annual asset allocation of Harvard and Yale at yearly intervals from July 1995 to June 2015. The only asset allocation adjustments made were to reallocate Cash so that the portfolio could be directly comparable to a fully invested portfolio. Further analysis of the underlying exposures of Harvard and Yale allowed us to divide their Equity and Fixed Income allocation into "US Domestic", "Non-US" and "Emerging" components.

For US Equities, we used an allocation to small cap, mid cap and large cap indices. Both Harvard and Yale tend to employ active managers and anecdotal evidence from annual reports indicates that these managers have a small cap and mid cap bias. For Private Equity we use the Cambridge Associates Indices and as a liquid proxy the LPX 50 Index along with small and mid cap indices. Real Estate is US based for the first 10 years and then moves to a global Index as evidence points to a domestic bias during the first 10 years. Commodities and Natural Resources exposure is a blend of a futures based index and an equity based index. The asset allocation for 2015 is presented in Chart 4 and places 56% of the portfolio in equity/bond asset classes with the remaining 44% allocated to alternative asset classes.

To calculate the performance of the EIP, a representative index was selected for each asset class (see appendix A), and returns were calculated by multiplying asset class weights by index returns. These returns were calculated in USD from July 1995 to June 2015 (20 years) and rebalanced annually every 30th June. For comparison purposes, an EIP hedged into GBP was also calculated. All returns are shown gross of management fees and access costs. The resulting performance of the EIP is shown overleaf in Table 4 and the annual returns are shown in Chart 5 below.

Chart 5: Harvard/Yale vs Endowment Index Portfolio Fiscal Year Returns[6]



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Endowment Index Portfolio Results

Table 4: Relative Performance of Endowment Index Portfolio (July 1995 to June 2015)[3,5,6,7]

	15Y Return (Annualised)	20Y Return (Annualised)	20Y Volatility (Annualised)	20Y Return/ Volatility Ratio	15/20 Yr Avg. % of Return Captured
Super Endowments - Harvard/Yale (Avg)	9.4%	12.7%	12.8%	1.0	
Super Endowments - Harvard/Yale (Avg) (GBP)	10.4%	13.6%	13.1%	1.0	
Endowment Funds › $1bn (94 Institutions)	6.8%	9.3%	12.3%	0.8	
Average US Endowment Fund (812 Institutions)	5.1%	7.7%	11.0%	0.7	
Endowment Index Portfolio (USD)	7.9%	10.4%	12.0%	0.9	83%
Endowment Index Portfolio (Liquid Private Equity USD)	8.0%	9.8%	12.5%	0.8	81%
US Equities (S&P 500 TR Index)	4.4%	8.9%	17.0%	0.5	
US Equity/Bond Portfolio (60:40)	5.1%	7.9%	9.9%	0.8	
Endowment Index Portfolio (GBP)	9.1%	11.3%	12.1%	0.9	83%
Endowment Index Portfolio (Liquid Private Equity GBP)	9.1%	10.8%	12.4%	0.9	81%
UK Equities (MSCI UK TR Index)	3.9%	6.8%	14.4%	0.5	
UK Equity/Bond Portfolio (60:40)	4.9%	7.2%	8.6%	0.8	
IA Mixed Investment 20-60% Shares Sector	3.7%	5.6%	7.5%	0.7	
IA Mixed Investment 40-85% Shares Sector	3.7%	6.2%	10.2%	0.6	
IA Mixed Investment Global Sector	2.6%	5.7%	13.6%	0.4	

Endowment Index Portfolio Findings

The EIP generated a 20 year annualised return of 10.4% (11.3% hedged into GBP) since July 1995, relative to 7.9% for a US Equity/Bond portfolio and 8.9% for a US Equity portfolio.

The EIP also out-performed UK Indices and many UK actively managed funds including both the IA Mixed Investment 20%-60% Shares sector by a margin of 5.7% per year and the IA Mixed Investment 40%-85% sector by a margin of 5.1% per year.

Comparatively, the EIP utilizing a liquid private equity proxy generated an annualised return of 9.8% (10.8% hedged into GBP) with only slightly greater volatility, highlighting the attractive returns that can be still be obtained without sacrificing liquidity.

Over the 20 year period and using annual return data, the EIP has a correlation of 94% to Harvard and Yale with an R squared of 88% indicating that the EIP is a good "fit" (T-Stat = 2.13).

Out-performance over long periods of time illustrates the benefits of a globally diversified asset allocation with significant allocations to alternative asset classes. Relative to an Equity/Bond portfolio, the EIP increased the 20 year annualized return by 32%. In addition, Equity/Bond portfolios have experienced a twenty year period of declining interest rates that have been a key driver of bond returns. Going forward, bonds have a low probability of generating these high historical returns.

While the EIP performance is not as strong as the Super Endowment Funds, it still manages to capture 83% of the Super Endowment's return, supporting Brinson/Ibbotson's et al findings that strategic asset allocation drives the majority of the variability of portfolio returns.

Summary

The Super Endowment Funds of Harvard and Yale have consistently achieved attractive investment returns with moderate volatility due to their multi-asset approach to investing, their strategic approach to asset allocation, and their significant exposure to alternative asset classes. Whilst the financial crisis of 2008 negatively impacted the performance of the US Endowment Funds, their long-term investment strategy has prevailed to the extent that total and risk-adjusted returns remain superior to those of traditional portfolios.

Whilst most investors do not have access to the superior resources of the Super Endowment Funds, this research note demonstrates that by applying their multi-asset principles to an investable index-based portfolio, there is considerable scope for achieving risk-adjusted returns that have historically been superior to those of more traditional portfolios.

"The EIP generated a 15 year annualised return of 7.9% (9.1% hedged into GBP), relative to just 5.1% for a US Equity/Bond portfolio and 4.4% for a US Equity portfolio."

Appendix A

Benchmark Indices Used

Each asset class referred to in this note is represented by a relevant market index. All indices are total return. Asset class index returns used are gross and have not been adjusted for management fees, administration and access costs.

Asset Class	Benchmark
US Equities	33% S&P 500 TR Index 33% S&P 400 Mid Cap TR Index 33% S&P 600 Small Cap TR Index
Non-US Equities	50% MSCI EAFE TR Index 50% MSCI EAFE Small Cap TR Index
Private Equity - Illiquid	65% Cambridge Associates Buyout Index 35% Cambridge Associates Venture Capital Index
Private Equity - Liquid	33% LPX 50 TU Index 33% S&P 400 Mid Cap TR Index 33% S&P 600 Small Cap TR Index
Emerging Equities	MSCI Emerging Markets TR Index
Global Bonds	65% Barclays Global Aggregate Bond Index 35% Barclays Global High Yield TR Index
Emerging Bonds	JP Morgan Emerging Markets Bond Index Plus
Real Estate	DJ US Select REIT TR Index to June 2005 DJ Global Select REIT TR Index From July 2005
Commodities/ Natural Resources	Bloomberg UBS Commodity TR Index to June 2005 50% Bloomberg Commodity TR Index from July 2005 50% S&P Natural Resources TR Index from July 2005
Absolute Return	Credit Suisse Hedge Fund Index
Benchmarks	
US Equities	S&P 500 TR Index
US Bonds	Citi US Broad Investment Grade Index
UK Equities	MSCI UK TR Index
UK Bonds	Citi UK BGI LCL Index

Important Notes and Source Data

This material is for information purposes only and is not a solicitation for investment. The contents of this document are based upon sources of information believed to be reliable. Frontier has taken reasonable care to ensure the information stated is factually true. However, Frontier makes no representation, guarantee or warranty that it is wholly accurate and complete.

1. Gary P. Brinson, L Randolph Hood and Gilbert I. Beebower, Determinants of a Portfolio Performance, The financial Analysts Journal, July/August 1986
2. Roger G. Ibbotson and Paul D. Kaplan, Does Asset Allocation Policy Explain 40%, 90% or 100% of Performance? The Financial Analysts Journal, January/ February 2000
3. National Association of College and University Business Officers Report ("NACUBO") (2015)
4. Cambridge and Oxford University Annual reports 2015
5. US Equity/Bond Portfolio calculated by Frontier applies a 60% weighting to the S&P 500 Total Return Index and a 40% weighting to the Citigroup US Broad Investment Grades Index
6. US University Endowment Annual Reports
7. 10, 15 and 20 year annualized returns for the Top 5 Endowment Funds by Assets and the Super Endowments (Harvard and Yale) are calculated by Frontier from data sourced in the annual report of each Endowment Fund. 15 Year annualized returns for the Average US Endowment Fund and Endowment Funds > $1bn is calculated by Frontier
8. Alternative Asset Allocation does not include private equity

PAST PERFORMANCE IS NOT INDICATIVE OF FUTURE PERFORMANCE

Appendix B

Academic Research on Endowments

Do (Some) University Endowments Earn Alpha?

Barber, Brad M. and Wang, Guojun, Financial Analysts Journal, (May 7, 2013)

In this research paper, Barber and Wang aim to determine if the average Endowment Fund earns an abnormal return (alpha) relative to standard benchmarks. Using a three and five factor model, they find that 95% and 99% respectively of the returns of the average Endowment can be explained by the performance of the underlying asset classes.

Some important quotes from the paper are below:

"The fact that the average allocations to asset classes explain the returns for top-performing and elite institutions provides insights into the mechanism used to generate the strong returns earned by these Endowments. Specifically, these results suggest that manager selection and dynamic (or tactical) asset allocation do not generate alpha for top-performing and elite institutions. Rather, large strategic allocations to alternative investments explain much of the documented cross sectional variation in performance."

"In summary, the average Endowment earns a mean return very close to average benchmark returns, and virtually all the time-series variation in Endowment returns can be explained by these benchmark returns. Thus the average Endowment could easily match the returns earned on its investments by indexing."

"There is intriguing evidence of performance persistence. Elite institutions and top-performing Endowments earn reliably positive alphas relative to simple public stock and bond benchmarks of about 1.7% to 3.8% per year." (driven by allocations to hedge funds and private equity).

This academic research is further evidence that indexing the asset allocation of top performing and elite Endowment Funds has merit. Part of Frontier's process involves examining the asset allocation of the top twenty Endowment Funds but in particular, we look at the asset allocation of the top five Endowments including Harvard and Yale. This has the benefit of smoothing out any single outlier.

About Frontier

Frontier manages a range of Endowment-inspired multi-asset funds and model portfolios. To obtain further information on index investing or to learn about Frontier's range of Endowment-inspired multi-asset solutions, please visit our website at www.frontierim.com

The "Endowment Index Portfolio" is a hypothetical portfolio that has been created by Frontier to calculate the historical investment performance achieved over a twenty year period through applying the average annual asset allocations of the Harvard and Yale University Endowment Funds to a set of broad market indices (selected from Appendix A) with rebalancing on 30 June of each year, gross of all fees and expenses. The Endowment Index Portfolio does not constitute an investment vehicle available to purchase by an investor. Therefore, the performance presented does not represent the performance of a real portfolio and may be subject to biases making it an unreliable indicator of performance. Past performance is no guarantee of future results and no assurance can be provided that any portfolio described herein would yield favourable investment results in the future. These performance tables and results are hypothetical in nature and do not represent trading in actual accounts.

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