

ENDOWMENT PERFORMANCE AND EXPOSURE TO ALTERNATIVE INVESTMENTS

by

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## ABSTRACT

The purpose of this thesis is to assess the performance of endowments which are well known for the endowment model of investing that places a huge emphasis on alternative investments. Several studies have shown not as good performance from endowments as their portfolio allocation to alternatives increases over time. I looked at endowment performance relative to the 60% stock/40% bond portfolio benchmark and endowment target return. I used National Association of College and University Business Officers (NACUBO)'s Commonfund Study of Endowments to collect endowment data and other indices to get data for different asset classes in endowment portfolio. From the results collected, I built a portfolio optimization model based on Markowitz modern portfolio theory. The overall results show that endowments cannot generate as good performance with increasing allocation to alternatives as seen before 2000. This coming period with potential changes in monetary policy will be a test for endowments, so whether their alternative investments can generate low correlation to the market and protect them from the downside risk.

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## INTRODUCTION

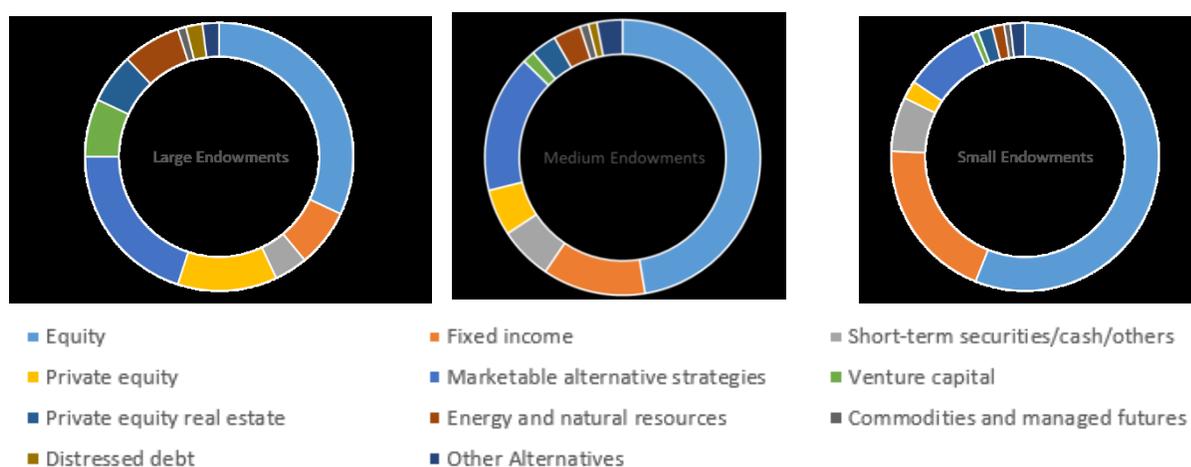
Endowments nowadays are widely known in the investment world for integrating the endowment model of investing, which is associated with considerable allocation to alternatives. The most famous case is the Yale University's endowment model, which stresses portfolio allocation to non-traditional asset classes. Many portfolio managers from Wall Streets and educational institutions have been trying to mitigate this approach but not everyone could generate the same success as Yale. Moreover, not every school model is similar to each other because of their sizes and access to the investment strategies. However, larger endowments tend to overweight alternative strategies and smaller ones allocate more of their funds to traditional asset classes.

As of 2017, the total Asset Under Management (AUM) among all U.S. endowments was over \$566.83 billion. Here is how 2017 AUM was distributed across endowments of all sizes.

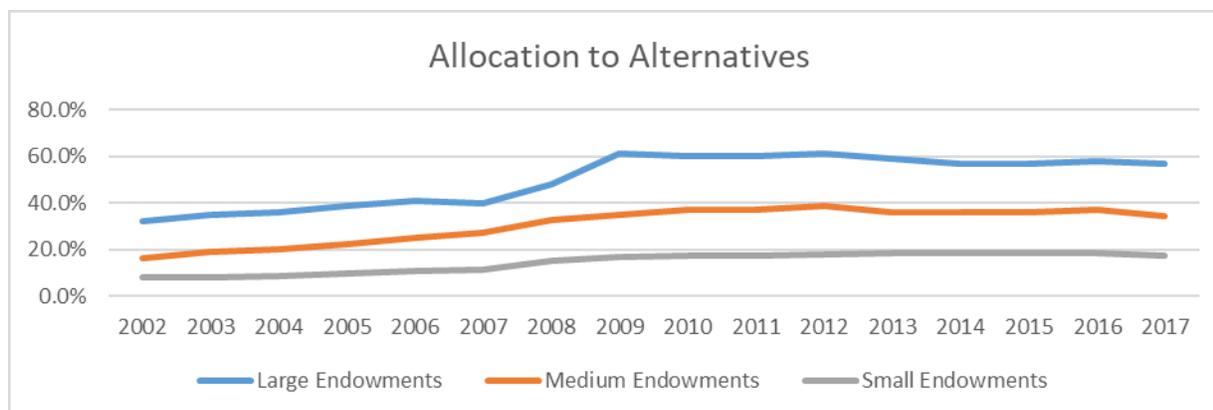
Size	Number	% of Total	Endowment Value	% of Total
<b>Over \$1B</b>	97	12.0%	\$427,510,393	75.4%
<b>\$501M to \$1B</b>	82	10.1%	\$59,934,736	10.6%
<b>\$101M to \$500M</b>	275	34.0%	\$61,854,980	10.9%
<b>\$51M to \$100M</b>	157	19.4%	\$11,766,306	2.1%
<b>\$25M to \$50M</b>	113	14.0%	\$4,356,875	0.8%
<b>Under \$25M</b>	85	10.5%	\$1,403,781	0.2%
<b>Total</b>	809		\$566,827,071	

Only 12% of total U.S. endowments have over \$1 billion AUM. However, those largest endowments contribute over \$400 billion, representing 75.4% of total AUM among all U.S. schools.

The traditional asset allocation used to be widely used by educational institutions comprises a majority of equities and bonds. Since the mid-1980s, college endowments adopted an alternative investment strategy that pivoted their performance assets from solely stocks and bonds to non-standard, assets including private equity, real assets such as real estate and commodities, venture capital, hedge funds, etc.



These alternative investment assets are associated with “illiquidity, longer investment horizon, less-than-transparent valuation, and other factors” (Leibowitz, Bova, and Hammond, 2010). The goal was to diversify the portfolio of stocks and bonds by investing into assets that have low correlations to the traditional portfolio, minimize volatility, and enhance returns (Kalos Financial, 2015).



Alternative assets have been playing a significant role in the endowment model of many of the U.S. educational institution. As of 2017, an average of 52% of total endowment assets are alternative investments (NACUBO). Endowments have been criticized for underperforming the market and the 60/40 portfolio, a common benchmark endowments compare their performance to, on a long-term basis. Especially, its presumed benefits of diversification did not work well as expected during the 2008-2009 financial meltdown. While a significant amount of assets in its diversified portfolio is expected to generate absolute return and minimize risk during financial turmoil, endowments average return of -18.7% significantly underperformed that of the 60/40 portfolio at -14% for the fiscal year ending 2009 (NACUBO). Recent disappointing performance, coupled with high fees, have led to mounting concerns among investors. However, it is important to note that endowments' goal is not to outperform the market but to generate a sufficient fund to cover university spending, inflation and other costs, which will be discussed later in the paper.

The purpose of this paper is to examine if the endowment portfolios have been able to outperform the 60/40 benchmark and meet their target returns. I used National Association of College and University Business Officers (NACUBO)'s Commonfund Study of Endowments to

collect data for endowments' returns, asset allocation and spending rates from 1992 to 2017. Then, I reassessed endowments' efficiency in meeting risk-return objective and built an optimal portfolio based on Markowitz's modern portfolio theory.

According to Brinson et al (1986), an endowment's return is dependent on its strategic asset allocation (policy), tactical asset allocation (market timing), and security selection decision. This paper focuses mainly on the passive element of decision making in a fund management process, which is strategic asset allocation decision.

## LITERATURE REVIEW

Since endowments started adopting a portfolio allocation strategy of reducing stakes in traditional U.S. equities and bonds, and investing in alternatives, their performance and rationale behind the strategy have been a hot topic. In the early days, this strategy seemed to pay off well. Daniel W. Wallick, Brian W. Wimmer, and James J. Balsamo once published a research naming *Assessing endowment performance: The enduring role of low-cost investing* to discuss variability in performance of endowment funds of different sizes in September 2014 following the previous version (Wallick, Wimmer, and Schlanger, October 2012). Endowment performance caught their attention because some institutions like Yale and Harvard posted very strong performance since endowments started increasing their exposure to alternative investments in the mid-1980s. The paper was questioning whether the sophisticated strategies that endowments of all sizes are pursuing really generate the remarkable returns claimed on the headlines. Wallick et al examined average investment returns over different time frames. They grouped endowments into three size cohorts: large (\$1 billion AUM or more), medium

(\$100 million to \$1 billion AUM), and small (less than \$100 million). Then they compared endowment returns with those of public mutual funds.

On an average basis, Wallick et al found out that over the 25 years up through June 2013, endowments generated returns either inline or lower than the those of 60% stock/40 bond portfolio and mostly better than active balanced funds except for the 5-year return. Overall, endowments saw a long-term success but have been struggling in the short-term. Endowments have been increasing their allocation to alternative investments so the recent period also saw the greatest use of alternatives. That raised a question whether increasing use of alternatives put downward pressure on returns. Although average returns of alternatives have been below that of public stock and bond benchmarks, large endowments, which also have the largest allocation to alternatives performed extremely well overall except for the 5-year period (Wallick et al, 2014). The increasing skewness in size of endowment was once discussed by Lerner et al (2008) as rich universities are getting richer while others fall behind. The overall performance was dragged down by weak performance from small and medium endowments, which cover about 90% of the total number of endowment funds. However, the majority of successful performance of large endowments is during the early to mid-2000s. Large endowments returned over 12.1% over the 19-year period up to June 2008, far beat the 9% average annual return of a 60% stock/40% bond portfolio and also the theoretical returns projected from standard risk and return model (Leibowitz, Bova, and Hammond, 2010). As endowments increase the presence of alternatives in their portfolio over the ten years to June 2013, excess returns over the 60% stock/40% bond benchmark from both large, and small and medium funds was declining.

Wallick et al also pointed out that large endowments have several advantages over the small and medium ones which helped them generate impressive returns when investing in alternative asset classes. First of all, large endowments have a larger source of investment expertise. On average, large endowments have about 10 professionals in their investment team. The ten largest even have a staff of 25 investment professionals (Wallick et al, 2014). Moreover, they also have stronger pricing power resulting from their capability to invest a significant amount of capital, which allows them to negotiate fees and avoid committing to the fund-of-fund structures. 95% of their alternative investments are made with investment managers. On the other hand, small endowments have to go through the fund-of-funds structure for 47% of their investments in alternatives, which incurs more fees and can potentially drag down performance (Wallick et al, 2014). High fees can be a barrier for some small endowments to choose a high performance fund. Along with investment expertise and pricing power, large endowments also have priority access to prestigious funds or new and highly potential investment opportunities. The resources and advantages that these endowments have cannot be easily imitated by other funds.

Josh Lerner, Antoinette Scholar, and Jialan Wang also pointed out in their paper *Secrets of the Academy: The Drivers of University Endowment Success* that endowment size and admissions selectivity significantly contribute to the success of an endowment. Their superior asset selection ability and investment committees, broad network with investment managers, and broad knowledge bases help them reap remarkable profits when investing in risky asset classes like alternatives (Lerner et al, 2008). These explain why even though endowments overall have gradually shifted toward alternative investments, there is still heterogeneity in the

share of total endowment committed to alternatives. Moreover, merely imitating asset allocation of some of the successful endowments does not guarantee the same performance to the other endowments. Although strategic asset allocation is a critical determinant of the performance of a fund, poor asset selection can also have negative effects on performance (Swensen, 2009). Some of the best performing hedge funds and private equity are not opened to new investors so those who are new to alternative investments will not have the same variety of funds to choose from. Beside access to better funds, large endowments also are better at picking funds as they can outperform the smaller ones when investing in funds that do not have constrained access (Lerner et al, 2007).

## **DATA & METHODOLOGY**

### ***Data***

The paper utilized multiple data sources to compare endowments historical return and asset classes to their benchmark. Data on historical performance, asset allocation and returns from asset classes is from the National Association of College and University Business Officers (NACUBO)'s Commonfund Study of Endowments (NCSE). Data availability only allowed me to use data from 1998 to 2017 to analyze total average annual returns. Data on asset allocation and return from asset classes only cover the 2005-2017 period. NSCE's data is collected from over 800 U.S. college and university endowments and affiliated endowments. As of 2017 these endowments represent \$566.8 billion in total asset under management (NACUBO).

NACUBO breaks down the list of endowments into 6 different sizes based on AUM: Over \$1 billion, \$501 million to \$1 billion, \$101 to \$500 million, \$51 to \$100 million, \$25 to \$50

million, and under \$25 million. For this paper particularly, I would categorize endowments into 3 sizes: large: \$1 billion or more, medium: \$101 million to \$1 billion, small: under \$100 million

Historical returns of the benchmarks are from the following sources:

1. **Domestic Equities:** Russell 3000 as the benchmark for domestic equities. The index is a combination of the large cap Russell 1000 and small cap Russell 2000 index (FTSE). The index covers a broader range of securities than the S&P 500, with about 98% of all U.S. equity securities.
2. **Non-U.S. Equities:** FTSE All-World ex U.S. Index, a benchmark for investors to gauge the performance of their international investments. The index includes large and mid-cap stocks from Developed and Emerging market countries. Data is derived from the FTSE Global Equity index (GEIS), covering 98% of total world's investable market capitalization (FTSE).
3. **Fixed Income:** Barclays U.S. Aggregate Bond which measures performance of U.S. investment grade bond market (ETFdb).
4. **Private Equity:** Thompson Reuters Private Equity Buyout Index that tracks gross of fees returns of the U.S. private equity industry (Thompson Reuters).
5. **Marketable Alternative Strategies (Hedge Fund):** EurekaHedge Hedge Fund Index, a weighted index of 2711 constituent funds which provide a broad measure of the performance of all underlying hedge fund managers irrespective of regional mandate (EurekaHedge).
6. **Venture Capital:** Thompson Reuters Venture Capital Index, which measures gross performance of the venture capital industry by calculating performance of the six

sector portfolios including Information Technology, Healthcare, Consumer, Industrials and Materials, Telecommunication, and Utility and Energy (Thompson Reuters)

7. **Real Estate:** Cambridge Associates Real Estate Index, based on gross return data from 988 real estate funds, including fully liquidated partnerships formed between 1986 and 2017 (Cambridge Associates).
8. **Energy and Natural Resources:** S&P Global Natural Resources Index, which includes 90 of the largest publicly-traded companies in natural resources and commodities businesses with exposure across 3 primary sectors: agribusiness, energy, and metals & mining (S&P Dow Jones Indices).
9. **Commodities and Managed Futures:** Eureka hedge CTA/Managed Futures Hedge Fund Index, an equally weighted index of 449 constituent funds (Eureka hedge)
10. **Distressed Debt:** Eureka hedge Distressed Debt Hedge Fund Index, an equally weighted index of 28 constituent funds and designed to provide a broad measure of the performance all underlying hedge fund managers (Eureka hedge)

### ***Methodology***

From the data collected, I compared the average 1-year, 3-year and 10-year annualized return of endowments of different sizes to the 60/40 portfolio. The 60/40 portfolio I constructed consists of 60% MSCI World Index and 40% Barclays Aggregate Bond Index. This will extend the results collected from the Vanguard research discussed earlier in the Literature Review. Endowments' goal is usually not to outperform a specific benchmark but to meet their target return and risk objectives so they can provide stable source of fund for university

spending. Therefore, I would compare endowment returns with their target returns. From the results collected, I could examine if the idea that increasing allocation to alternatives is dragging down performance of endowments still applies in the recent period. For the last part of this research, I would go further with reconstructing an optimal portfolio for the total endowment portfolio by applying the modern portfolio theory.

In order to assess endowment performance, we need to know target return of endowments and risk tolerance.

### **Target Return = Spending Rate + Inflation**

Spending rate was estimated as 10-year average historical spending rate of endowments of all sizes. It is 5% for large and 4.5% for small and medium endowments. Inflation rate is based on the Higher Educational Price Index (HEPI), with the 10-year historical average of 2.5%. With that, target return for large endowments is **7.5%** and for medium and small is **7%**.

### ***Portfolio optimization***

Modern portfolio theory is developed by Harry Markowitz in the paper: "Portfolio Selection" published by the Journal of Finance in 1952. It is considered the fundamental of modern portfolio construction. The hypothesis focuses on the idea that investors can construct an optimal portfolio on the efficient frontier that generates a maximum possible expected return with a given level of risk or a minimum risk level with a given target return. For the purpose of this research, I constructed 3 portfolios based on three different criteria:

- Meet the target return of 7.5% and minimize risk
- Meet the target return of 7% and minimize risk
- Maximize Sharpe ratio

I used historical return of each asset class from fiscal 2011 to 2017 to build the model.

There are two main components of the optimization model: **Expected Returns & Variance**

1. **Expected returns matrix:**  $R_p = \sum_{i=1}^N w_i \cdot R_i = W \cdot R$

- $R$  - Expected return vector. It was built using the combination of 50% Fama-French 3-factor model and 50% historical returns of each asset class in the endowment portfolio. It's important to note that there is no best way to estimate expected return.
- $W$  - Portfolio weight vector. It was built so that the total weight of all asset classes in the portfolio equal 1.

2. **Portfolio variance matrix:**  $\sigma_p^2 = \sum_{i=1}^N w_i \cdot w_j \cdot \sigma_{i,j} = W \cdot W' \cdot S$

- $W'$  - Transpose of  $W$
- $S$  - Shrunk covariance matrix = 65% Original covariance matrix + 35% diagonal version. The rationale behind creating the shrunk matrix is to increase the accuracy of the original matrix because I had quite a few data points.

○ Covariance matrix =  $\frac{\tilde{X}'\tilde{X}}{N}$

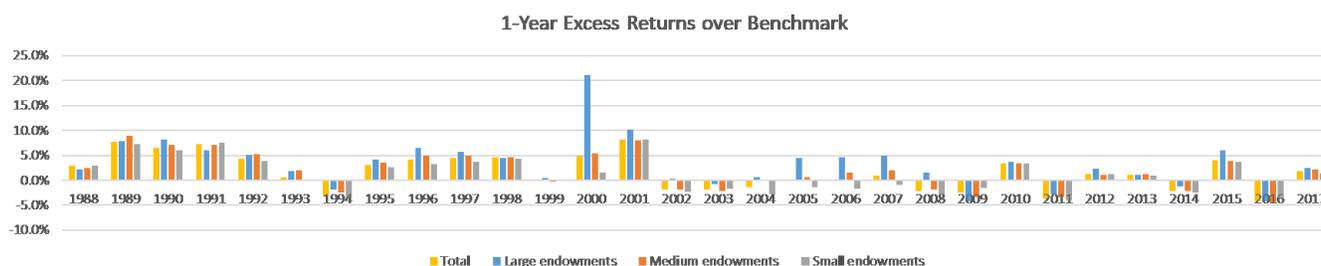
- $\tilde{X}$  - Demeaned return. It was calculated by subtracting average return of each asset class from the annual returns.
- $\tilde{X}'$  - Transpose of  $\tilde{X}$

- $N$  – Number of data points for each asset class. In this case, it is 7 because I used annual return of each asset class from 2011 to 2017
- Shrunken matrix: Set the off-diagonal of the original matrix to zero

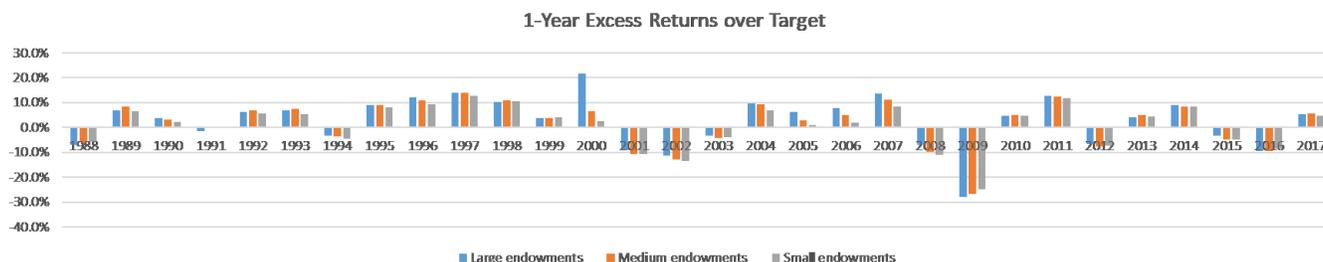
After setting up all the equations, I used Excel solver to help determine the target weight based on conditions set for each of the three scenarios stated earlier with the assumption that short-selling is not allowed.

## RESULTS AND DISCUSSION

### 1-Year Performance

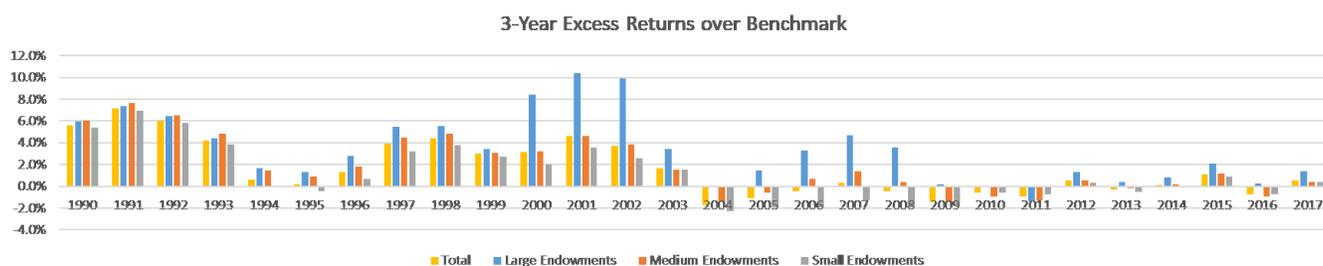


Starting from the early 2000s, we cannot see as good performance from endowments relative to the 60/40 benchmark as in the previous period. One argument is after the tech bubble in early 2000s and the housing crisis in 2008-2009, quantitative easing around the world pushed down interest rates in the U.S. and several developed countries, which resulted in better performance of equity and fixed income – the two asset classes that make up the 60/40 portfolio benchmark.



As stated earlier, endowment goal is not to outperform a specific benchmark. Excess returns over target gives us a better idea on how endowments have been performing because it focuses on if endowments have met their target of generating sufficient funds to cover university spending. We can see that since the financial crisis, returns have been more volatile for all three kinds of the endowments. However, with the type of investment funds like endowments, it is more preferable to look at long-term performance rather than short-term to give the best assessment on their performance.

### 3-Year Performance



Endowments usually determine their annual spending as a percentage of portfolio. Also, most of them apply a smoothing term to their spending policy that aims to mitigate effects of market swings and stabilize revenue stream. Usually target spending is determined as a percentage of the three-year moving average of the portfolio's ending balance. Therefore, it is important to look at endowments' three year annualized performance. Since the early 2000s, endowments have not generated as much excess return over benchmark as seen in the 90s.

Even large endowments struggled but they mostly could slightly outperform the benchmark.

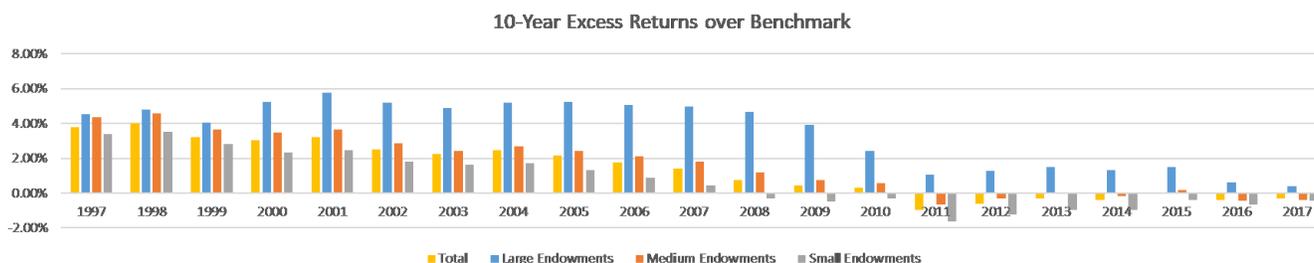
Overall, they are still the best performers.



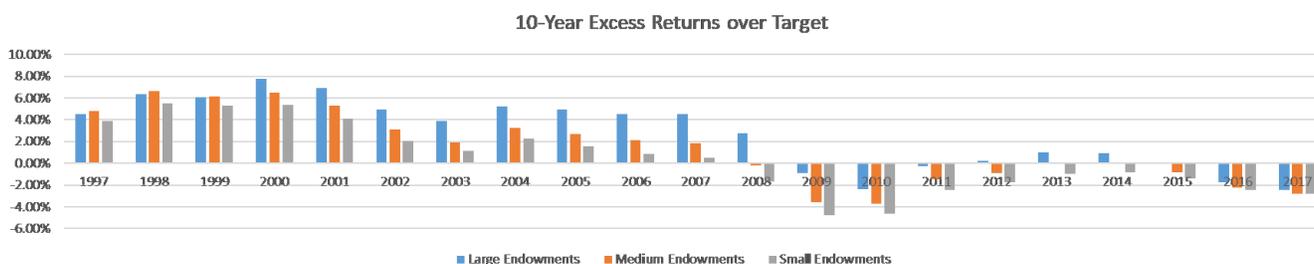
When looking at excess return over target we can see more of similarity in the pattern among the three kinds of endowments. They all could not meet their target returns during financial downturn. It seems that alternative investments which are supposed to help diversify the portfolio and minimize risk couldn't fully protect endowments from downside risk to provide a stable source of income to universities. It was once again proved that during financial turmoil, correlation tends to spike up for most asset classes, except for safe haven assets like Treasuries and gold, and diversification does not work (Koesterich, 2015). That continues even in the period after that because investors would gauge macro conditions to adjust their investment portfolio.

It is interesting to point out that endowments had only posted a negative 3-year rolling excess return over target during financial crisis, however, in the past two years, did generate negative excess return. That is something to watch going forward because 3-year annualized performance of endowments affects their contribution to university funding.

## 10-Year Performance



With a large amount invested in alternatives and because of the nature of endowments, it's reasonable to focus on long term performance. Endowments significantly outperformed the benchmark in the period before the financial crisis in 2008-09. Looking back at the 1-year performance, we can see that was mainly from the very great performance early in the 90s up to 2000s. That helped smooth out the endowment performance so that we can see very good 10-year return till the most recent financial downturn. It is also once again confirmed that large endowments are the best players when they are the only one that outperform the 10-year performance benchmark every year up to 2017.

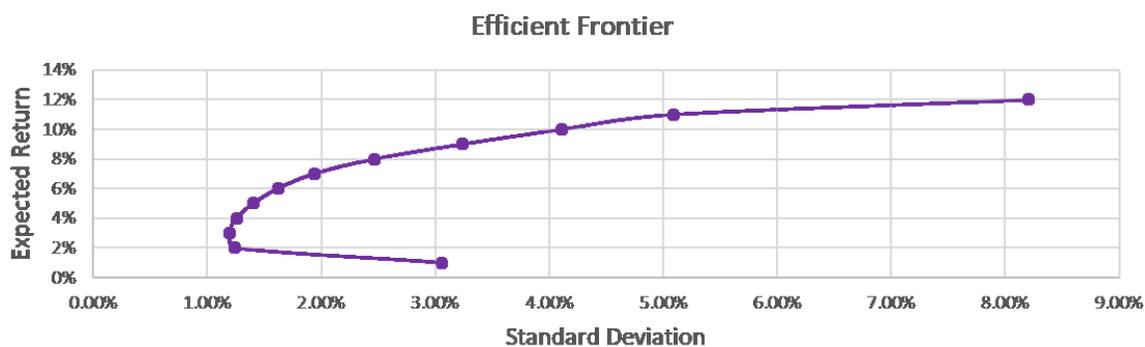


When looking at the 10-year excess returns over target we see more variability in the performance over time. Recently all three types of endowment could not meet their target return. Even though the performance is not as bad as seen during the financial downturn but getting close. This has become the main controversial issue because people argue that while

	Std.dev	Endowment	SPY	MSCI World
the equity market has done extremely	3-year	5.90%	10.24%	10.62%
well in the recent years, endowments on	5-year	6.59%	9.85%	10.20%
	10-year	10.79%	15.01%	16.28%

the other hand, by and large posted disappointing performance. However, we cannot deny that endowment performance is less volatile than the equity market.

## Portfolio Optimization

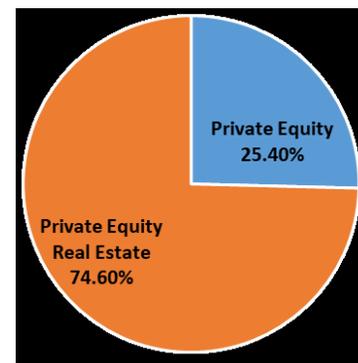
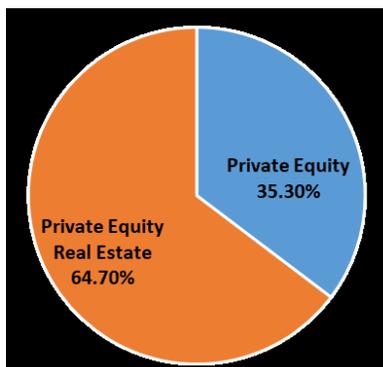
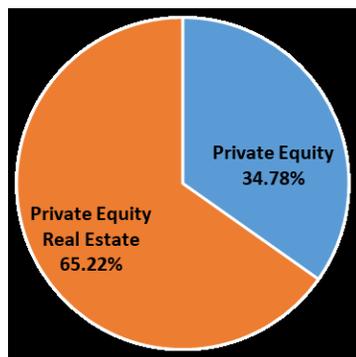


Above is the efficient frontier that shows optimal portfolios created from different combinations of expected return and variance criteria. From that population, I picked out three portfolios that meet the criteria mentioned in the Methodology section.

<b>Max Sharpe</b>	
Standard Deviation	2.58%
Portfolio ER	7.53%
Sharpe	1.76

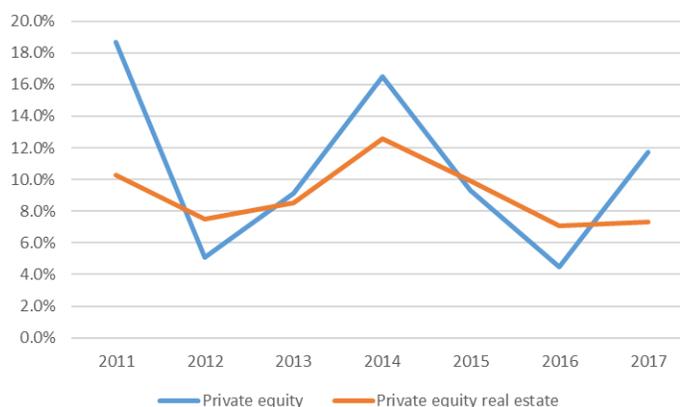
<b>E(Rp) = 7.5%</b>	
Standard deviation	2.56%
Sharpe	1.74

<b>E(Rp) = 7%</b>	
Standard deviation	2.30%
Sharpe	1.74



All the three portfolios allocate only to two asset classes: Private Equity and Private Equity Real Estate. Average standard deviation of the three portfolio is around 2.5%, which is significantly lower than the standard deviation of the total endowment portfolio from the 2011-2017 period, at around 7%.

However, in my opinion, these portfolios cannot represent an optimal portfolio because there is not enough diversification. The two asset classes' performance is highly correlated with 10-year correlation coefficient of 0.75.



It is very common for Markowitz portfolio optimization model to generate a portfolio that only allocates to two or three assets. In order to come up with an optimal portfolio we have to blend the projected portfolio with the portfolio manager's assumptions of the expected performance of each asset class in the portfolio.

## CONCLUSION

Endowments have been known for integrating alternative investments in their strategy. They also have been criticized recently for their poor performance while the market and the portfolio benchmark have done very well in the same period. However, endowments do not intent to outperform any benchmark or the market, but to support university operations. In this paper, I studied how endowments determine their target return and how they have been performing relative to their target. Moreover, I used Markowitz portfolio optimization theory to build a portfolio designed to meet the target of endowments.

From my research, I find that endowment performance relative to the 60% stock/40% bond portfolio benchmark has been not that great compared to the period before 2000s both in short-term and long-term. However, before we could conclude if endowments should allocate their portfolio to 60% stock and 40% bond like the benchmark, we had to consider that this past period with very low interest rate has been ideal for 60/40 portfolio. As interest rate is rising not only in the U.S. but also other developed countries as global economy is heating up, we would likely see not as good performance from the benchmark portfolio. This coming period would be a test for endowment portfolio, so whether their investments into alternative that is supposed to give them low correlation to the market can protect them from the down side.

Looking at their returns over target, there is much more volatility since the financial crisis. This period also sees an all-time high allocation to alternatives. The rolling 3-year annualized excess return over target, which I consider the most important indicator of endowment performance shows very clearly that performance has worsened recently when the economy is doing well. It is the only time when endowments generate negative returns relative

to the target when the economy is not in a crisis. That is something endowments should consider to assess if they would need to adjust their strategy for portfolio allocation.

My portfolio optimization model does not generate an optimal portfolio because it surely does not provide enough diversification to the portfolio and further work should be done to come up with an optimal portfolio. Moreover, as I stated earlier, this paper focuses only on the passive strategic asset allocation. David Swensen, who invented the famous Yale Model, once said in his book *Pioneering Portfolio Management*: “Only through active management do investors can realize the full potential of alternative investments.” Therefore, to fully assess the performance of endowments, we also have to consider other are factors such as portfolio management, market timing, and security selection, which could significantly affect the how each individual endowment performs.

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