

Long-Term Investment Pool & Similar Funds (LTIP)

Investment Review for Calendar 2016

Submitted March 2017

This cover page provides a summary overview of the Pennsylvania State University Long-Term Investment Pool (LTIP) for Calendar Year 2016. The second page summarizes LTIP-related data that is discussed in detail on the remaining pages, along with performance analysis.

Executive Overview

Long-Term Investment Pool (LTIP) Performance

Annualized *net* investment returns for the Penn State University LTIP (adjusted for the impact of gifts and spending, and after external investment management expenses) for periods ending December 31, 2016 are:

<u>Calendar 16</u>	<u>3 Years</u>	<u>5 Years</u>	<u>10 Years</u>
5.9%	4.8%	8.4%	5.8%

Long-Term Investment Pool Market Value (pg 3)

As of December 31, 2016, Penn State University's LTIP was valued at \$3.75 billion, which includes \$2.44 billion in endowment assets and \$1.31 billion in non-endowed funds. An additional \$130 million was held as Similar Funds (see page 2 for details). Endowment spending is reviewed on pages 2 and 3.

Review of Investment Markets (pg 4)

The graph below compares respective returns for the 12-months ending December 31, 2016 and December 31, 2015 for the S&P 500, MSCI All Country World (ACWI) ex-US, Bloomberg Commodity Index, Bloomberg Barclays Aggregate Bonds, and publicly-traded Real Estate Investment Trusts (REITs) Indexes. As shown below, Calendar 2016 respective returns for all categories exceeded their 2015 performance.

Investment Diversification and Asset Mix (pg 5)

At calendar year-end, 49% of LTIP assets were invested in public equities (domestic and foreign) and 23% in private equity and venture capital, for a combined 72% of LTIP representing growth-oriented assets. In addition, 15% was invested in fixed income/cash, 5% in real assets, and 8% in diversifying (hedged) strategies.

Comparative Fund Performance (pg 6)

Penn State's LTIP returned 5.9% net for the year ending December 31, 2016, shy of the 6.8% return of the Passive Policy Portfolio, while LTIP's 3-yr and 5-yr relative performance was notably better than the respective passive benchmark returns.

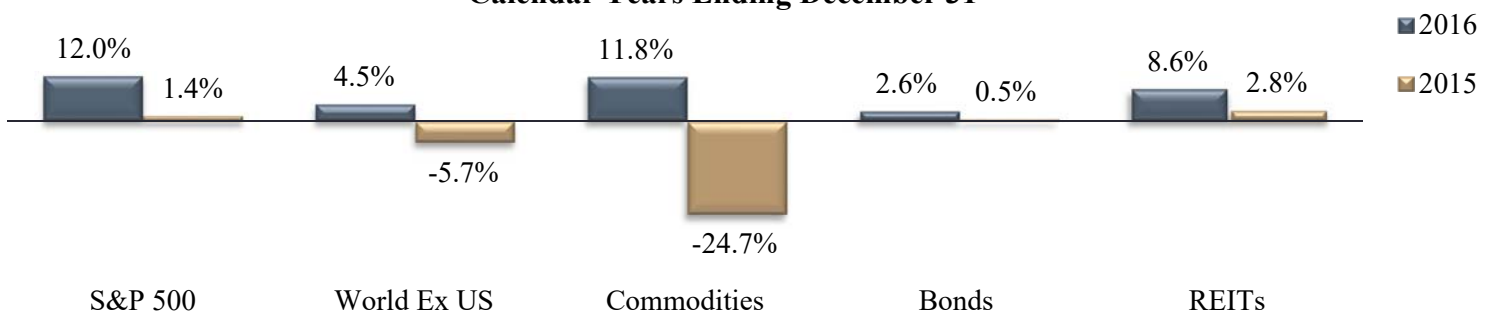
LTIP Performance and Spending (pg 7)

LTIP's average annual net returns of 5.8% and 7.5% for the last 10- and 20-year periods, respectively, have generally enabled LTIP to attain inflation-adjusted returns in excess of spending, achieving long-term intergenerational equity.

LTIP Liquidity (pg 8)

With nearly one-half of assets convertible to cash in a matter of days, the LTIP maintains adequate liquidity to satisfy anticipated cash requirements.

**Investment Market Returns
Calendar Years Ending December 31**



5-Year LTIP Facts and Figures

	Annual Periods Ending December 31				
	<u>2016</u>	<u>2015</u>	<u>2014</u>	<u>2013</u>	<u>2012</u>
<i>Investment Performance</i>					
Endowment ¹ (annualized net returns)	5.9%	1.1%	7.6%	14.2%	14.0%
<i>Market Values</i> (\$ millions)					
Endowment ¹	2,443.0	2,340.3	2,310.1	2,120.7	1,859.0
<u>Similar Funds²</u>	<u>129.9</u>	<u>115.2</u>	<u>108.3</u>	<u>109.7</u>	<u>94.3</u>
Endowment and Similar Funds	2,572.9	2,455.5	2,418.4	2,230.4	1,953.3
Gifts & Other Additions (\$ mils)	68.8	122.4	120.1	87.3	52.6
Annual Spending (\$ mils)	97.1	95.1	79.6	73.1	71.2
<u>Non-Endowed Funds³</u>	<u>1,306.7</u>	<u>1,286.8</u>	<u>1,121.3</u>	<u>1,081.0</u>	<u>717.3</u>
Total LTIP ⁴ & Similar Funds	3,879.6	3,742.3	3,539.7	3,311.4	2,670.6
1) Endowment — donor-restricted gifts					
2) Similar Funds — deferred gifts and donor-restricted funds in transit to Endowment					
3) Non-Endowed Funds earmarked for FAS 106 liability (employee post-retirement health care benefits) & President's Strategic Initiative Fund. These funds were phased in between 2009 and 2016.					
4) Commingled assets over which Penn State's Office of Investment Management (OIM) has investment responsibility, as approved by the Penn State Investment Council (PSIC), exclusive of Similar Funds					

Investment Market Returns for Calendar Years Ending 2016 and 2015

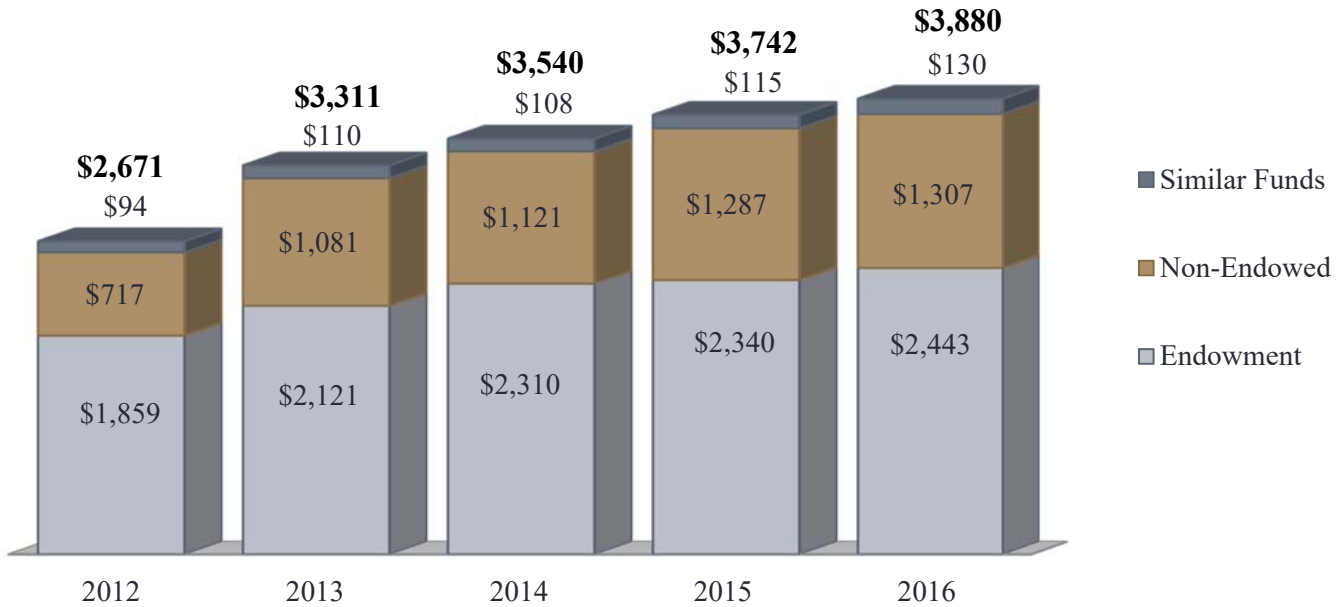
The performance of major investment market indexes that impact Penn State University's Long-Term Investment Pool (LTIP) are illustrated on the previous page and discussed below for the calendar years ending 2016 and 2015:

- **Equities:** US Equities returned 12.0% and 1.4%, respectively, for the calendar years ended December 31, 2016 and 2015. Non-US Equities rebounded during Calendar 2016, returning 4.5% vs -5.7% for 2015.
- **Commodities:** The Bloomberg Commodities Index returned 11.8% in 2016, which was a marked improvement over the -24.7% return in 2015.
- **Fixed Income:** In Calendar 2016, the Bloomberg Barclay's US Aggregate Fixed Income index gained 2.6% outpacing bonds' 0.5% in 2015.
- **REITS:** Private Real Estate Investment Trusts continue a positive trend, returning 8.6% in 2016 versus 2.8% in 2015.

Long-Term Investment Pool Market Value

As of December 31, 2016, Penn State’s Long-Term Investment Pool was valued at \$3.75 billion, including non-endowed funds in the amount of \$1.31 billion that have been commingled into the LTIP. Non-pooled assets — charitable remainder trusts, charitable gift annuities, and other life income funds in addition to donor restricted funds — accounted for an additional \$130 million, shown below as Similar Funds, for a total \$3.88 billion in assets.

Long-Term Investment Pool Market Value
Calendar Years Ending December 31
 (\$ millions)



Endowment Assets

Endowment assets increased by \$102.7 million during Calendar 2016, from \$2.34 billion to \$2.44 billion. As seen in the table on page 2, endowed gifts added over the last 12 months totaled \$68.8 million, while endowment program support (spending) amounted to \$97.1 million. Current endowment spending has been approved by the Board of Trustees to remain at an annual rate of 4.5%.

Long-Term Investment Pool

Excluding \$130 million in similar funds that are managed externally, the market value of the Long-Term Investment Pool (LTIP) totaled \$3.88 billion as of December 31, 2016. In addition to endowment assets of \$2.57 billion, LTIP includes \$1.31 billion in non-endowed assets that have been commingled for investment purposes, but are restricted to the ongoing funding of the University’s FAS 106 liability. Also included in LTIP is \$200 million for the Presidents’ Strategic Initiative Fund.

The remainder of this report will focus on the Long-Term Investment Pool, including all commingled funds.

Review of Investment Markets in Calendar 2016

In the table below, representative financial market returns are listed for 1-, 3-, and 5-year periods covering four major asset categories: Global Equities (divided into US Equities and Non-US Equities), Fixed Income, Commodities, and Private Capital. The performance of investment markets that impact Penn State University's Long-Term Investment Pool (LTIP) is discussed below

<i>Annualized Percentage Returns as of December 31, 2016</i>	<u>1 Year</u>	<u>3 Years</u>	<u>5 Years</u>
Global Equities U.S.			
S&P 500 Index (US Large Cap Equities)	12.0	8.9	14.7
Russell 3000 Index (Total US Equities)	12.7	8.4	14.7
Russell 2000 Index (US Small Cap Equities)	21.3	6.7	14.5
Global Equities Non-U.S.			
MSCI All Country Ex-U.S. Index (ACWI Ex-US)	4.5	-1.8	5.0
MSCI Developed Non-U.S. Index (EAFE)	1.0	-1.6	6.5
MSCI Emerging Markets Index (EME)	11.2	-2.6	1.3
Fixed Income			
Bloomberg Barclays US Aggregate Bond Index	2.6	3.0	2.2
Bloomberg Barclays US Treasury TIPS Bond Index	4.7	2.3	0.9
Citigroup World Global Bond Index (WGBI)	1.6	-0.8	-1.0
Commodities			
Bloomberg Commodities Index	11.8	-11.3	-9.0
Gold (SPDR GLD)	7.8	-2.0	-7.8
Private Capital (9/30/16)			
Venture Capital (Cambridge Associates)	2.2	15.9	14.1
Private Equity (Cambridge Associates)	8.7	10.8	13.1
Private Real Estate (Cambridge Associates)	9.2	11.3	11.2

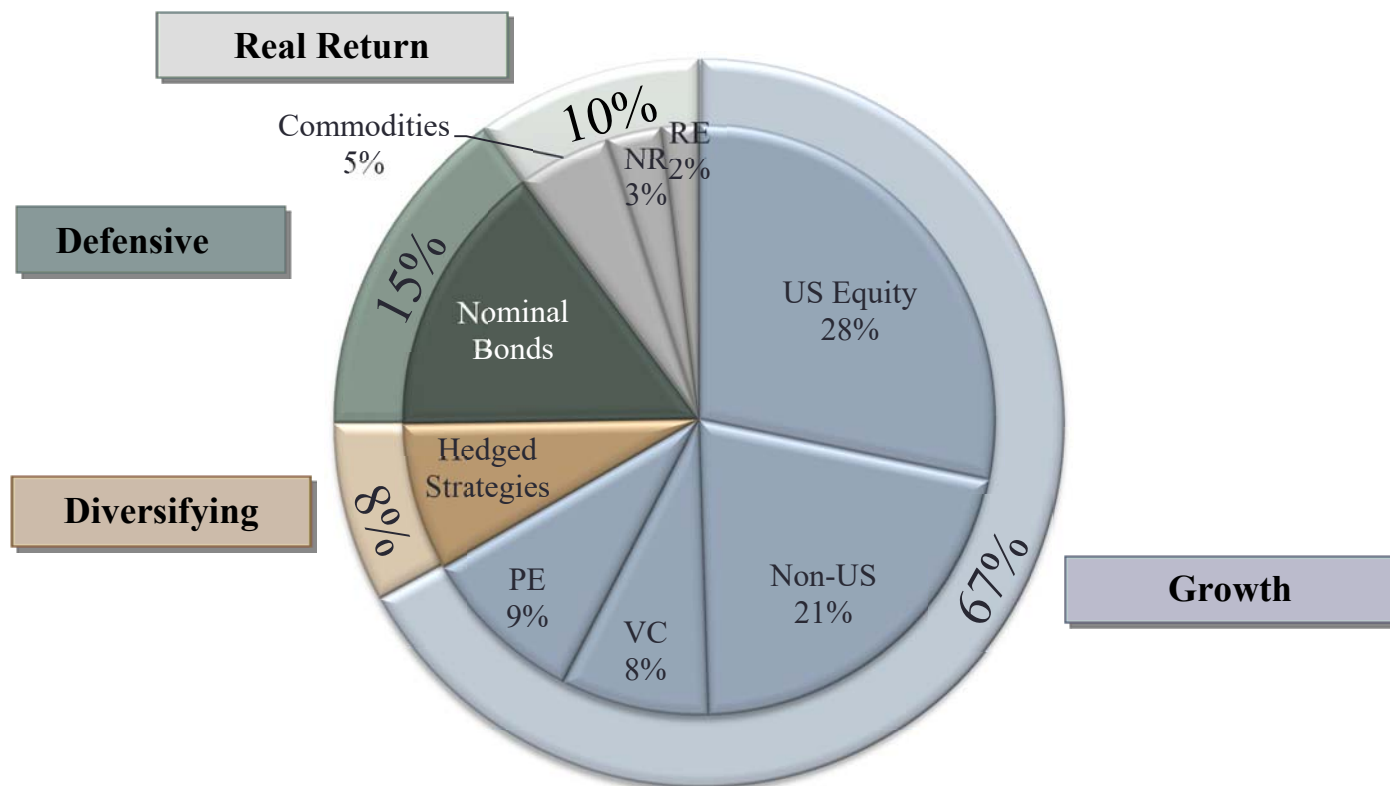
Market Notes:

- **Global Equities:** US Equities recorded double-digit advances for the calendar year, as well as the 5-year period ending December 31, 2016. US Equities continued to outpace non-US Equities over all three periods. Non-US Equities in total were up 4.5% in Calendar 2016, with Developed Markets (EAFE) returning 1.0% and Emerging Market Equities (EME) returning 11.2%.
- **Fixed Income:** In Calendar 2016, US Aggregate Fixed Income gained 2.6%, while US TIPS returned 4.7%, and Citigroup WGBI posted 1.6%.
- **Commodities:** The Bloomberg Commodities Index climbed an impressive 11.8% for the year, while 3- and 5-years still posted declines, at -11.3%, and -9.0% respectively. Gold's 7.8% return struck a comfortable middle ground among commodities overall.
- **Private Capital:** Private Real Estate, Private Equity, and Venture Capital slowed to single digit returns for the last year, but continued with gains for each of the 3- and 5-year periods ending 9/30/2016, which is the latest reporting period for non-marketable investments.

On the following two pages, LTIP's broad and detailed asset mix is discussed, followed by the composite investment returns for each of the four above asset categories compared to corresponding LTIP returns.

Investment Diversification and Asset Mix

Asset allocation is a primary determinant of investment performance and risk control. LTIP's asset mix combines four strategic investment themes – growth (economic-sensitive), diversifying (low sensitivity to economic/investment market fluctuations), real (inflation-sensitive), and defensive (counter-sensitive to market turbulence) – to maximize potential returns, while tempering volatility. In the graph below, the four macro investment themes are shown in the outermost ring with their December 31, 2016 allocations of 67%, 8%, 10%, and 15%, respectively. Over time, the percentages vary depending on market trends and allocations approved by the Penn State Investment Council.



At a more granular level, LTIP's diversified portfolio includes a variety of traditional asset classes that comprise the four strategic themes, as shown by the slices within the inner pie (percentages are rounded):

- Growth (67%): 28% in publicly-traded US and 21% in publicly-traded non-US common stocks, as well as 8% in venture capital (VC), and 9% in private equity (PE) funds.
- Diversifying (8%): 6% in credit-related, and 2% in equity-related strategies.
- Defensive (15%): 5% in investment grade bonds, 4% in global bonds, and 5% in short-term investments.
- Real Return (10%): 2% in real estate (RE), 3% in natural resources (NR), and 5% in commodities.

The above grouping by investment themes provides insight to the functional role of the various asset classes within LTIP. The relative allocations represent comparative long-term return expectations, tempered by risk-mitigating assets to offset capital market turbulence. Hence, the approximately 67% currently allocated to growth is intended to take advantage of the capital appreciation and purchasing power protection historically offered by higher returning equity investments. Given the sometimes volatile nature of equity returns, 15% is invested in defensive (fixed income) and 8% in various hedged strategies to provide stability and diversification during times of market turbulence and uncertain economic conditions. In addition, 10% of LTIP is allocated to real return in order to help neutralize inflationary episodes.

LTIP Performance Compared to Passive Portfolio

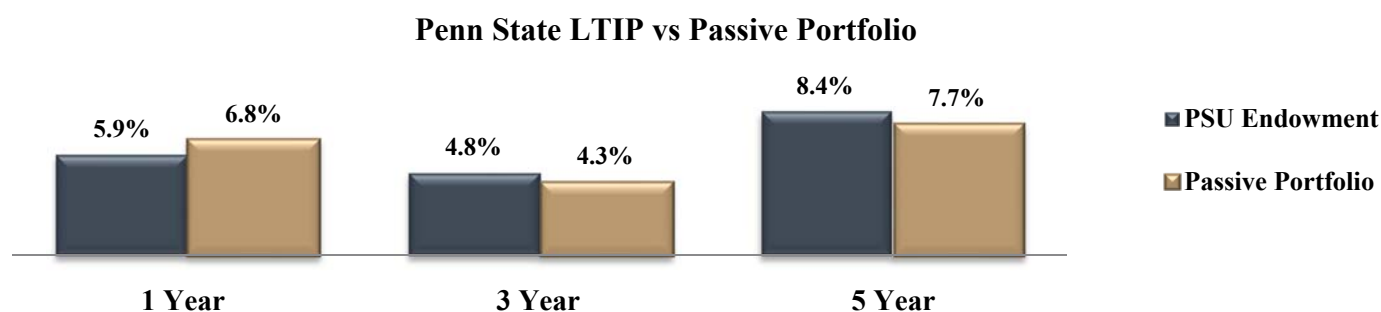
The Long-Term Investment Pool's investment performance is measured against a hypothetical *Passive Portfolio*, comprised of four broad asset categories: Public Equities (55%), Private Capital (20%), Fixed Income (20%) and Commodities (5%). This passive portfolio serves as a blended benchmark against which the performance of the actual, actively-managed, and more broadly-diversified LTIP portfolio is monitored. This approach represents practical implementation of investable targets based on the foregoing conceptual, strategic themes.

These categories are very broadly defined: the equity and fixed income categories include hedge funds whose strategies are equity and/or credit oriented, respectively, while commodities include hedged and long-only strategies. The custom index for Private Capital includes representative private equity, venture capital, and private real estate partnership time-weighted returns.

In the table below, the respective static weightings of the four asset categories are associated with corresponding market benchmarks and their respective index returns to generate *Passive Portfolio* returns over 1-, 3-, and 5-year horizons for the calendar years ending 12/31/2016:

<u>Asset Class</u>	<u>Benchmark</u>	<u>Weighting</u>	<u>Annualized Benchmark Returns</u>		
			<u>1 Year</u>	<u>3 Years</u>	<u>5 Years</u>
Public Equities	MSCI All Country World	55%	7.9	3.1	9.4
Total Private Capital	Custom Index	20	6.9	12.4	12.8
Fixed Income	Bloomberg Barclays Agg Bond	20	2.6	3.0	2.2
Commodities	Bloomberg Commodities	5	11.8	-11.3	-9.0
Total Passive Portfolio (net)		100%	6.8%	4.3%	7.7%

Note: The weightings used above are assumed to be constant over the entire 5-year period.

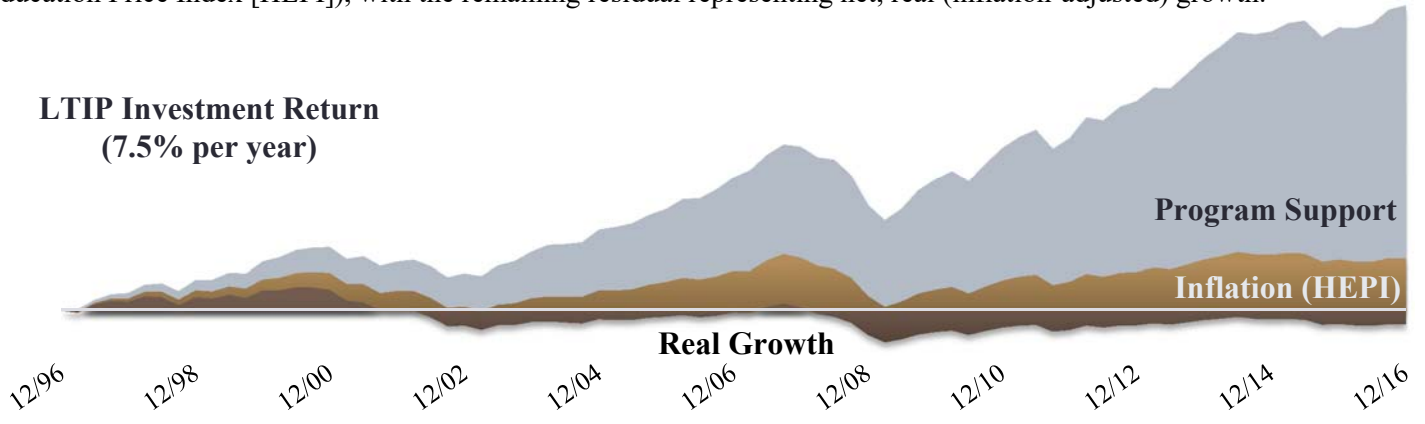


As shown above, Penn State's LTIP returned 5.9% net for Calendar 2016, lagging the 6.8% return of the Passive Portfolio over the trailing 12 months. For the 3- and 5-year periods, the Long-Term Investment Pool's annualized returns of 4.8% and 8.4% outpaced the Passive Portfolio's returns of 4.3% and 7.7%, respectively. These returns indicate that, over the long term, LTIP was able to outperform passive indexes through selection of active investment managers and broad diversification of assets as shown on the previous page.

The Passive Portfolio provides a guidepost to help achieve long-term results that are consistent with the twin objectives of purchasing-power preservation, along with stable LTIP spending. LTIP's performance varies from the *static* Passive Portfolio as a consequence of several factors, including, but not limited to, the timing of cash-flows, tactical shifts in asset mix, and individual investment manager performance and turnover

Long-Term LTIP Growth and Spending

In the chart below, the top line represents the cumulative net investment return of the Penn State Long-Term Investment Pool (LTIP) over the last 20 years, averaging 7.5% per year. The layers illustrate investment returns apportioned to program support (spending, as previously discussed on pages 2 and 3) and inflation (as measured by the Higher Education Price Index [HEPI]), with the remaining residual representing net, real (inflation-adjusted) growth.



Cumulative 20-year Returns

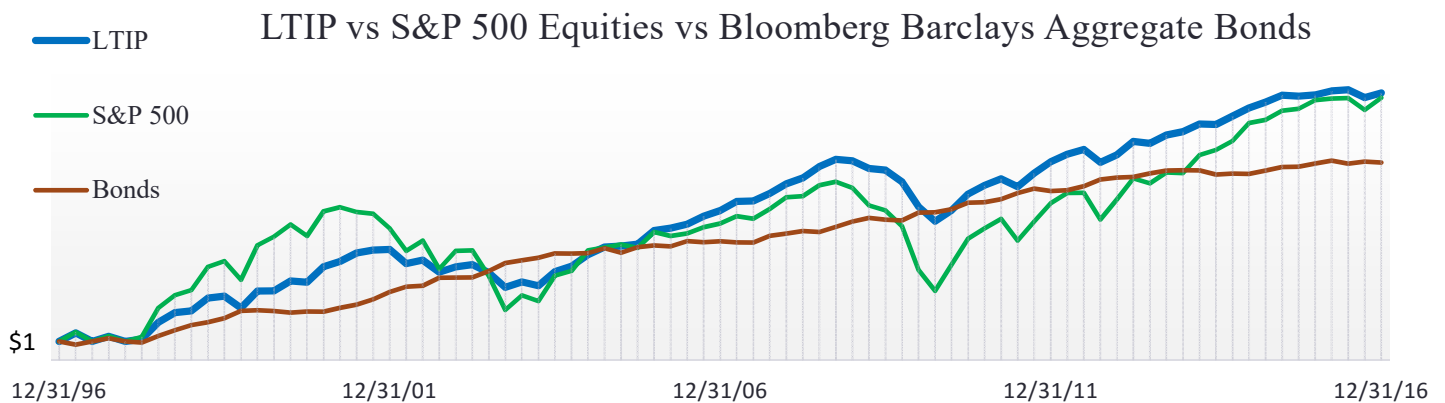
LTIP’s primary investment goal is to earn a long-term rate of return sufficient to support *current* spending and to preserve *future* purchasing power. This two-pronged objective is illustrated by apportioning total nominal (i.e., before adjusting for inflation) investment return (topmost line above) into discrete layers, representing program support and inflation, along with a residual layer corresponding to net *real* growth.

Because investment returns periodically fluctuate (illustrated by the jagged topography above), real growth, which nets out program support and inflation from total LTIP return, oscillates around the horizontal line, which represents “intergenerational equity”. While market fluctuations have caused real growth to swing positive and negative across the horizontal line, intergenerational equity has largely been achieved.

20 Years of LTIP Growth Relative to Equities and Bonds

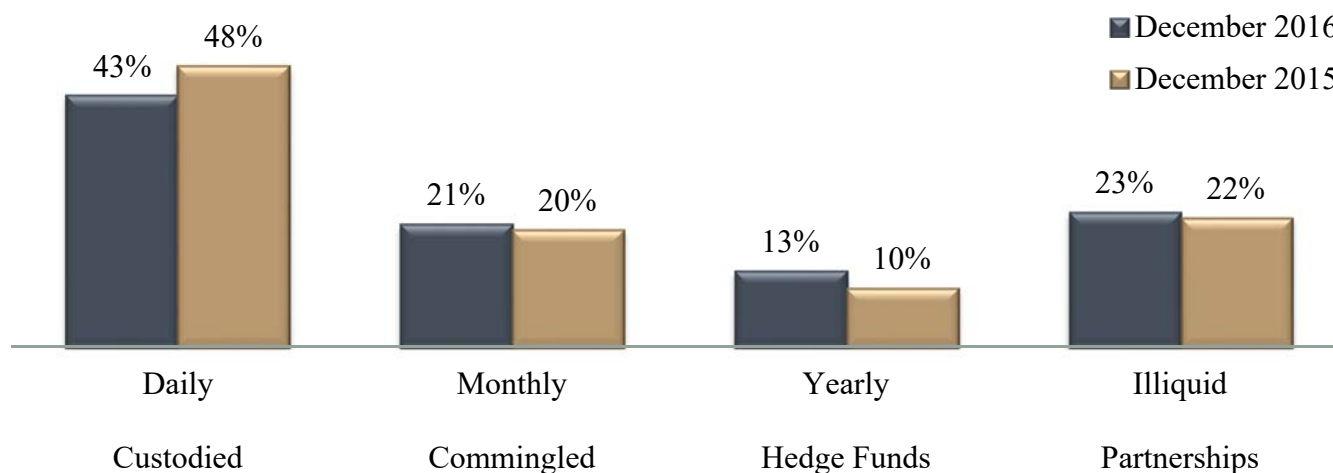
The top line of the chart above, representing the growth of \$1 compounded at LTIP’s average annual return of 7.5% for 20 years ending 12/31/2016, is compared in the chart below (LTIP- thick blue line) to the same period cumulative returns for the S&P 500 Index (S&P 500- green line) and Bloomberg Barclays Aggregate Bonds (BBAGG- brown line).

As shown, the 20-year cumulative growth for LTIP’s diversified portfolio has essentially matched that of the S&P 500 Index with less-pronounced oscillations, indicating that LTIP was less volatile than equities over the same period. Both have clearly outpaced the growth of \$1 invested in bonds (BBAGG). LTIP’s return also outpaced the blended return of a hypothetical balanced portfolio comprised of 70% equities and 30% bonds, as represented on the previous page.



Long-Term Investment Pool Liquidity

Financial crises are characterized, among other considerations, by lack of liquidity, as institutions are unable to meet current obligations due to lack of available cash. In the graph below, LTIP assets are classified according to how quickly they can be converted to cash. Securities listed on exchanges or traded over-the-counter, and held in custody as separately managed accounts, can be liquidated on a daily basis (typically 1- and 3-day settlement for bonds and stocks, respectively). Commingled portfolios, i.e., collectively-managed investment pools of publicly-traded securities, are eligible for purchase or sale at least once a month. Hedge fund partnerships are typically open for at least partial liquidation once a year, with a few having more and/or less frequent liquidity “windows.” Non-marketable partnerships are considered illiquid primarily because of the inability of limited partner investors to transact at will.



Observations from the blue (left) bars of each of the four pairs above for the period ending December 31, 2016:

- 43% percent of LTIP assets are invested in stocks and bonds that can be converted to cash in a matter of days. Of this, 6% is currently held in money market accounts and short-term fixed income investments.
- Commingled portfolios, primarily non-US public equities, comprise 21% of LTIP assets and can be converted to cash within 30 days or, in some cases, sooner. Commingled investment structures are used for non-US holdings in lieu of registering in individual countries where foreign companies are headquartered.
- 13% of LTIP assets are invested in various diversifying hedge fund partnerships and can be at least partially converted to cash annually or, in many cases, quarterly.
- 23% percent of LTIP assets are invested in more than 120 different partnership funds or other non-marketable investments that are considered illiquid because underlying holdings are typically not readily marketable or the timing of future realizations into cash distributions is uncertain.

The foregoing indicates that LTIP maintains sufficient liquidity to satisfy anticipated cash requirements.

Liquidity Trends

As shown above, the liquidity profile of Penn State’s LTIP has shifted somewhat from the end of Calendar 2015 (tan bars) to the end of Calendar 2016 (blue bars). Daily liquidity dipped slightly to 43% with increased short-term investments, while monthly liquidity increased from 20% to 21%. Yearly liquidity rose to 13%, while illiquid non-marketable alternative assets increased from 22% to 23%. Over time, stepped up commitments to partnerships will gradually result in larger representation by non-marketable investments.