Real Money:

Option Strategies to Meet Institutional Liabilities

DGV Solutions

CBOE RMC USA 2017

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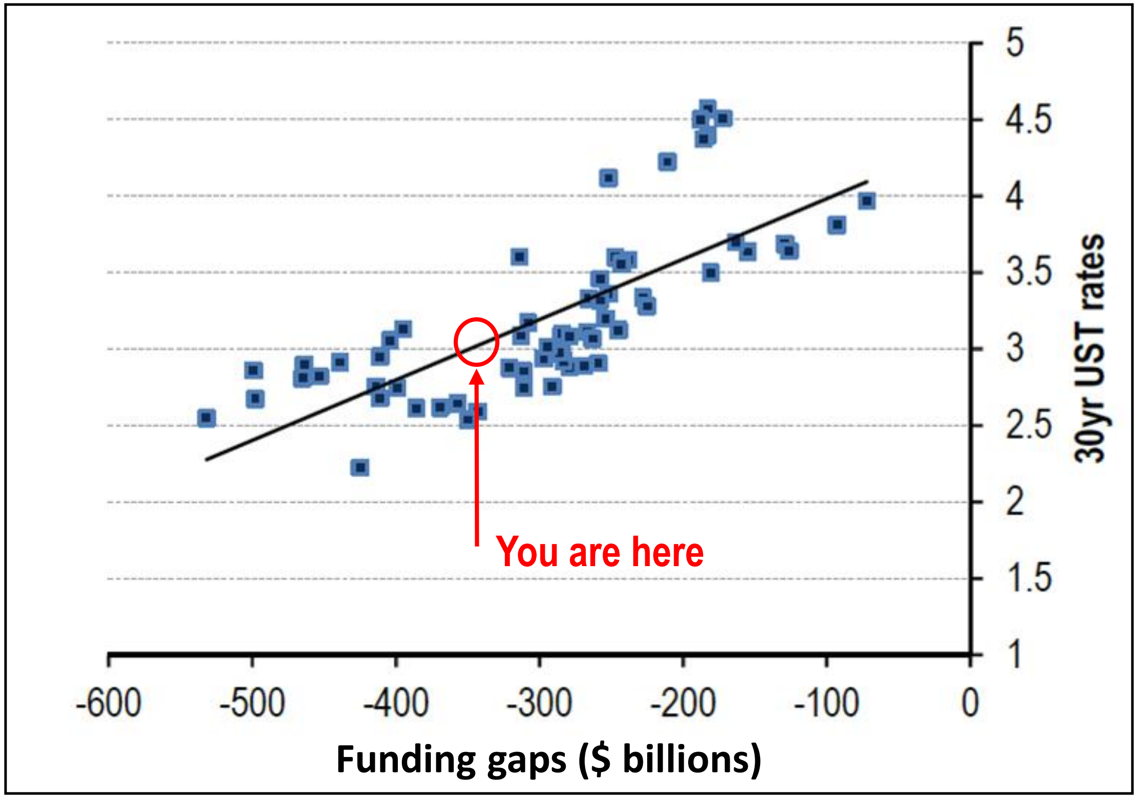
Institutional Liabilities

- Pension plans face the tyranny of funded status ratios that are doubly geared to economic variables
- Endowments require high returns to meet spending objectives, while new gifts are highly correlated to risk assets
- It is critical to maintain allocations to equities and their high return expectations to have any chance of meeting liabilities
- Option strategies that reduce downside exposure – even at the expense of upside participation – without reducing return expectations, better align assets with the overall enterprise risk/liabilities of the institution

Institutional Liabilities

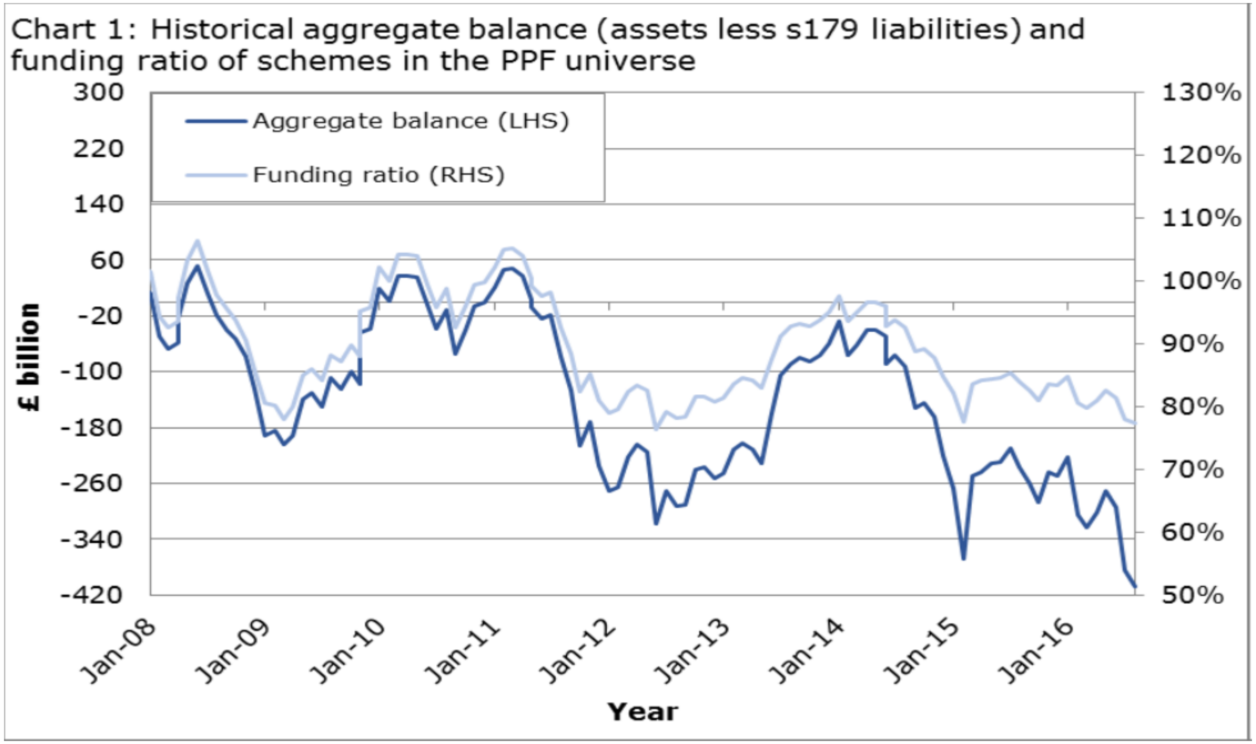
Funding Gaps of Top 100 U.S. Corporate Defined Benefit Pension Plans



Source: BofAML Global Research, Milliman

Institutional Liabilities

Pension Plans Covered by the UK Pension Protection Fund



Source: UK Pension Protection Fund

- **85% of Britain's 6,000 pension funds covered by the PPF are in deficit.**
- **The total deficit was £408 Billion ($530 Billion) at the end of July.**

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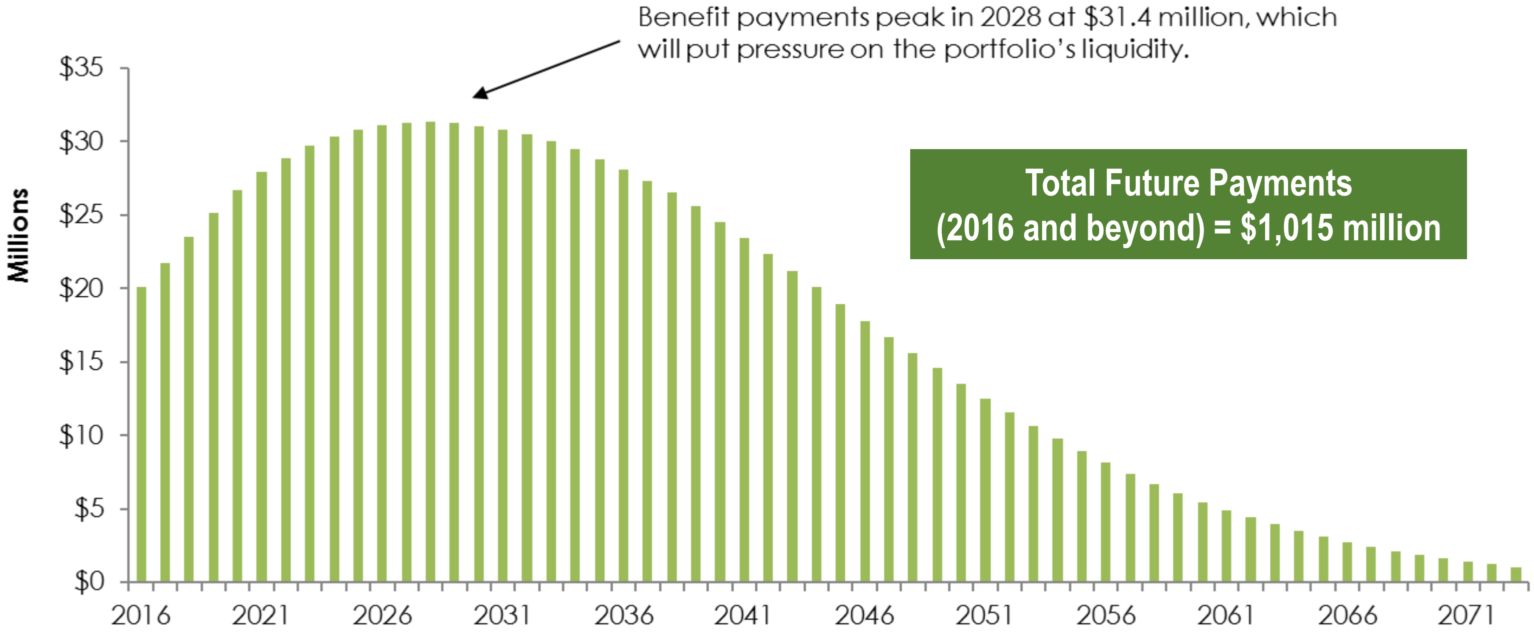
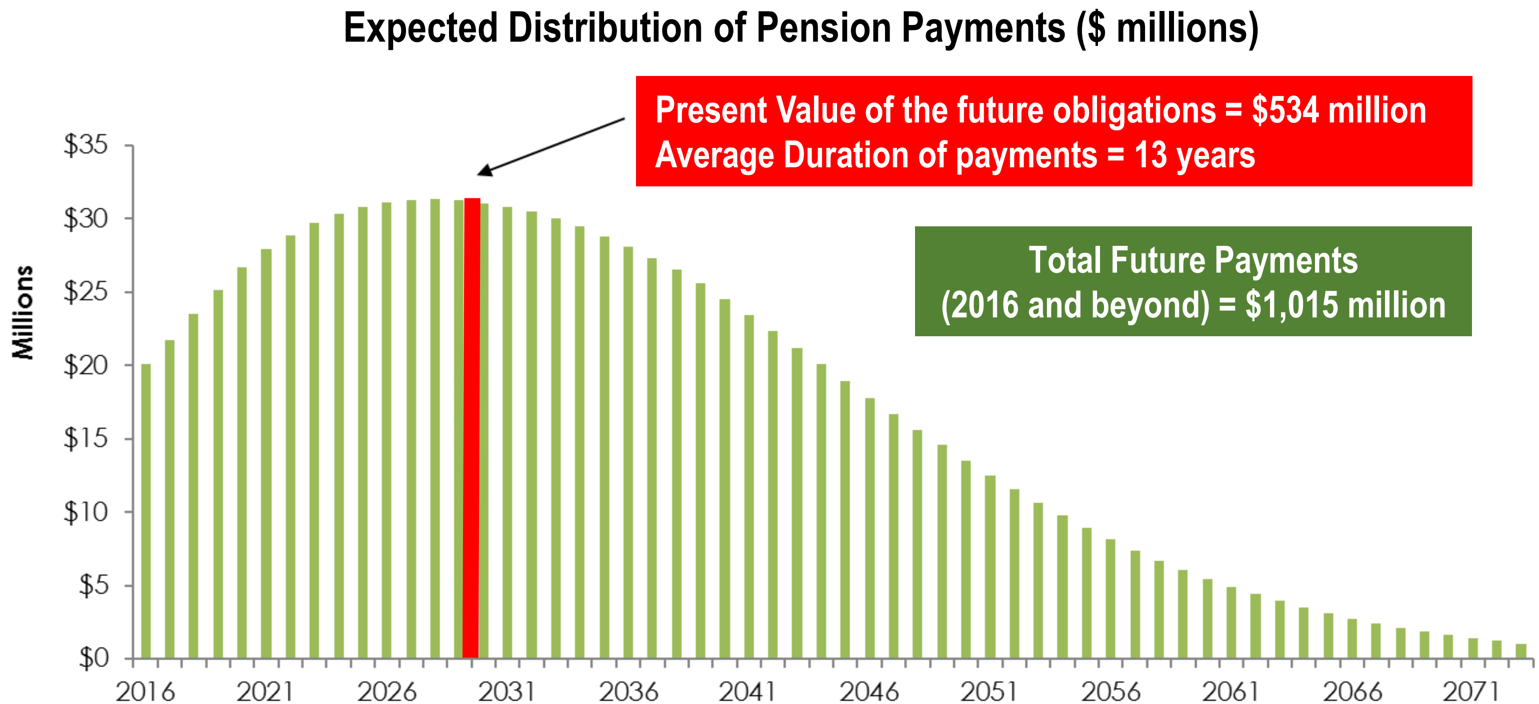
Sample Pension Distributions

Expected Distribution of Pension Payments ($ millions)



- **Payments from the hypothetical plan will change over time as current employees retire, terminated employees become eligible for payments, and current retirees pass away**
- **The distribution pattern can be estimated as above based on actuarial assumptions (mortality rates, expected retirement rates, etc.)**

Sample Pension Distributions



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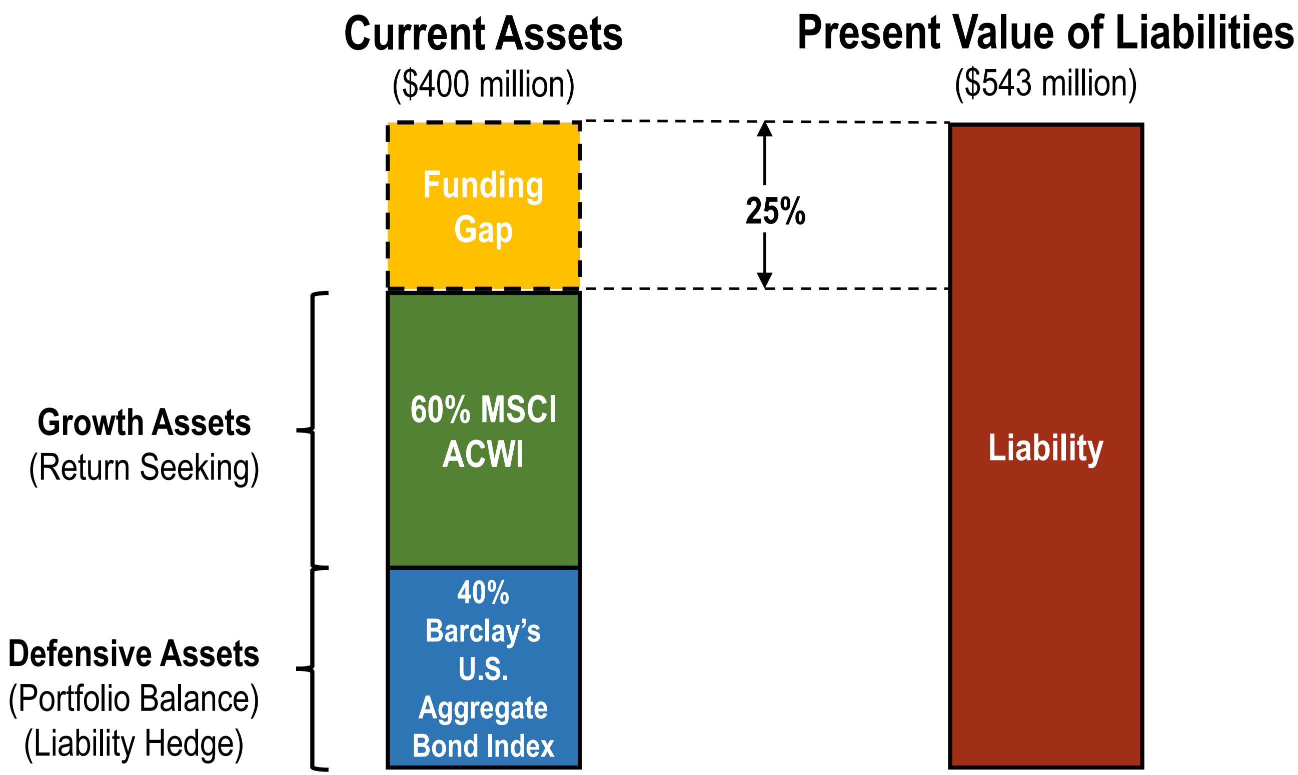
Sample Pension Assets



- **We assume a very simple portfolio of Global Equities and U.S. Investment Grade Bonds proxied by the MSCI ACWI and the Barclay's U.S. Aggregate Bond Index**

Sample Pension Funded Status Matrix

Funded Status Ratio							
	Interest Rate Movements						
Return on MSCI ACWI	-150bps	-100bps	-50bps	3.80%	+50bps	+100bps	+150bps
+30%	76%	82%	87%	93%	99%	104%	109%
+20%	70%	76%	80%	87%	93%	98%	103%
+10%	64%	70%	75%	81%	87%	92%	97%
0%	58%	64%	69%	75%	81%	86%	91%
-10%	52%	58%	63%	69%	75%	80%	85%
-20%	46%	52%	57%	63%	69%	74%	79%
-30%	40%	46%	51%	57%	63%	68%	73%

Source: DGV estimates

- The Funded Status of this hypothetical plan currently stands at 75%
- Market movements for the growth assets (MSCI ACWI) will positively or negatively affect the Funded status
- Interest rate rises (or declines) will hurt (help) bond exposures in the portfolio (Barclay's U.S. Aggregate Bond Index), which have a duration of ~5.5 years
- Interest rate rises (or declines) will help (hurt) liability exposures, which have a duration of ~13 years

Sample Pension Funded Status Matrix

Funded Status Ratio

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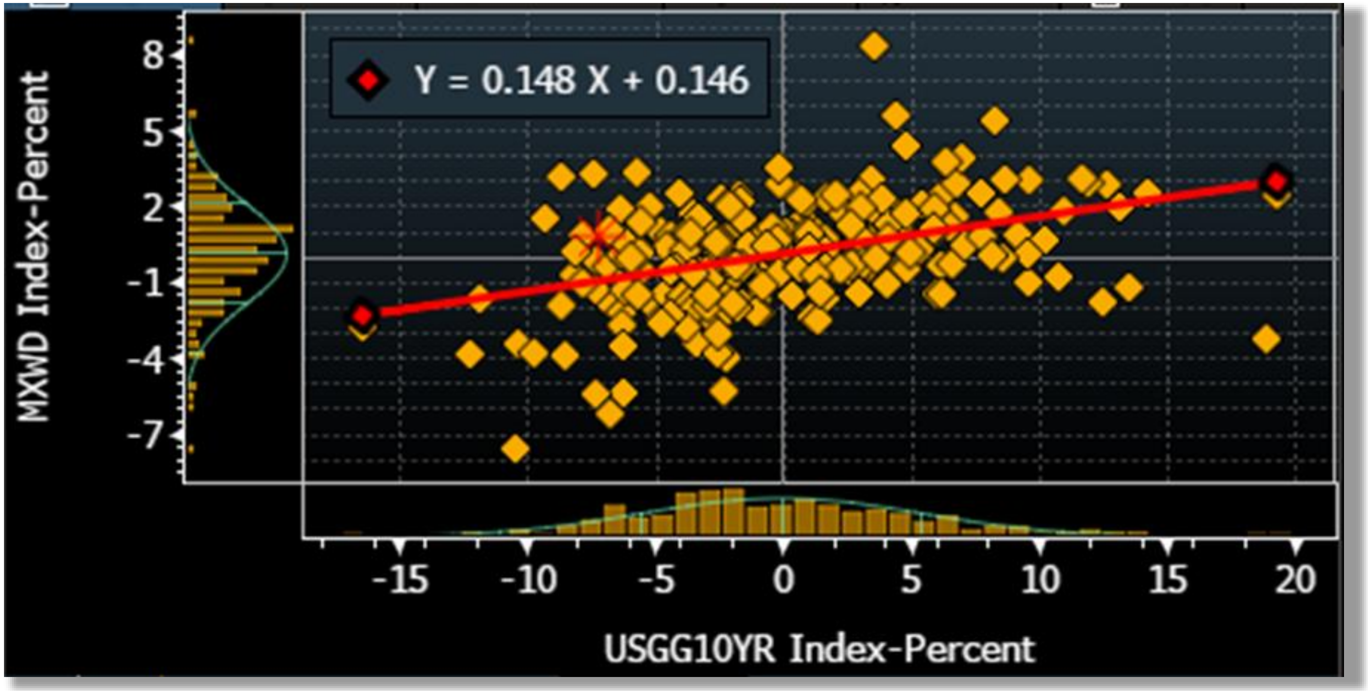
+20%	70%	76%	80%	87%	93%	98%	103%
+10%	64%	70%	75%	81%	87%	92%	97%
0%	58%	64%	69%	75%	81%	86%	91%
-10%	52%	58%	63%	69%	75%	80%	85%
-20%	46%	52%	57%	63%	69%	74%	79%
-30%	40%	46%	51%	57%	63%	68%	73%

Funded Status ratios are sensitive to movements in Global Equity markets. With no change in interest rates, a +/- 30% move in equity markets will swing the Funded Status +/- 18%

- **The Funded Status of this hypothetical plan currently stands at 75%**
- **Market movements for the growth assets (MSCI ACWI) will positively or negatively affect the Funded status**

Equities and Yields

MSCI ACWI versus U.S. 10-Year Treasury Yields
(weekly return regression - 5 years through 8/2/16)



Source: Bloomberg

- **Global Equities and Bond Yields tend to be positively correlated**
- **A 30% rise in Global Equities would likely correspond with a 100 - 150bp rise in interest rates**

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Sample Pension Funded Status Matrix

Funded Status Ratio

	Interest Rate Movements						
Return on MSCI ACWI	-150bps	-100bps	-50bps	3.80%	+50bps	+100bps	+150bps
+30%	76%	82%	87%	93%	99%	104%	109%
+20%	70%	76%	80%	87%	93%	98%	103%
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-20%	46%	52%	57%	63%	69%	74%	79%
-30%	40%	46%	51%	57%	63%	68%	73%

Source: DGV estimates

In reality, given the positive correlation between Global Equities and interest rates, the Funded Status tends to be extremely volatile. A +/- 30% move in Global Equities may swing the Funded Status by 69% - a beta greater than 1.

- **Funded Status ratios can be extremely volatile due to the positive correlation between interest rates and Global Equities**
- **Investment strategies that provide downside protection in exchange for upside performance better match institutional liability profiles**

CBOE Put-Write Index

CBOE Put-Write Index

- **Sells 1-month at-the-money put options and rolls to the subsequent month upon expiration.**
- **Holds a collateral position of 1-month and 3-month U.S. T-bills fully backing the notional amount of puts sold.**

Annual Returns	CBOE Put-Write Index	S&P 500 Index
1989	24.57%	31.69%
1990	8.88%	-3.10%
1991	21.32%	30.47%
1992	13.80%	7.62%
1993	14.14%	10.08%
1994	7.09%	1.32%
1995	16.88%	37.58%
1996	16.41%	22.96%
1997	27.68%	33.36%
1998	18.54%	28.58%
1999	21.01%	21.04%
2000	13.06%	-9.10%
2001	-10.63%	-11.89%
2002	-8.58%	-22.10%
2003	21.77%	28.68%
2004	9.48%	10.88%
2005	6.71%	4.91%
2006	15.16%	15.79%
2007	9.51%	5.49%
2008	-26.77%	-37.00%
2009	31.51%	26.46%
2010	9.02%	15.06%
2011	6.17%	2.11%
2012	8.14%	16.00%
2013	12.28%	32.39%
2014	6.38%	13.69%
2015	6.40%	1.38%
2016	7.77%	11.96%
Total Return	1460.70%	1385.05%
Annual Return	10.31%	10.12%
Volatility	11.83%	17.75%

- The Put-Write Index has produced the best relative returns in low return (<10%) environments.
- Over 27 years, the Put-Write Index has outperformed the S&P 500 (+10.31% vs. +10.12%) with only two-thirds of the volatility.

Past performance relates to the referenced index(es), not the Fund, and does not guarantee, and is not necessarily indicative of, future results.

Source: Bloomberg; DGV

CBOE Put-Write Index

- In calendar years when the S&P 500 has returned less than +10% (including negative return years) the CBOE Put-Write Index has **outperformed by an average of 7.8% annually**.

S&P 500 Calendar Year Return Regime (1989-2016)								
	<0%		0%-5%		5%-10%		>10%	
S&P 500 Index (Observations)	-16.64%	(5/28)	2.43%	(4/28)	6.56%	(2/28)	22.75%	(17/28)
CBOE Put-Write Index	-4.81%		6.60%		11.65%		16.59%	
Over/Under Performance	**11.83%**		**4.16%**		**5.09%**		**-6.15%**	

Source: Bloomberg; DGV

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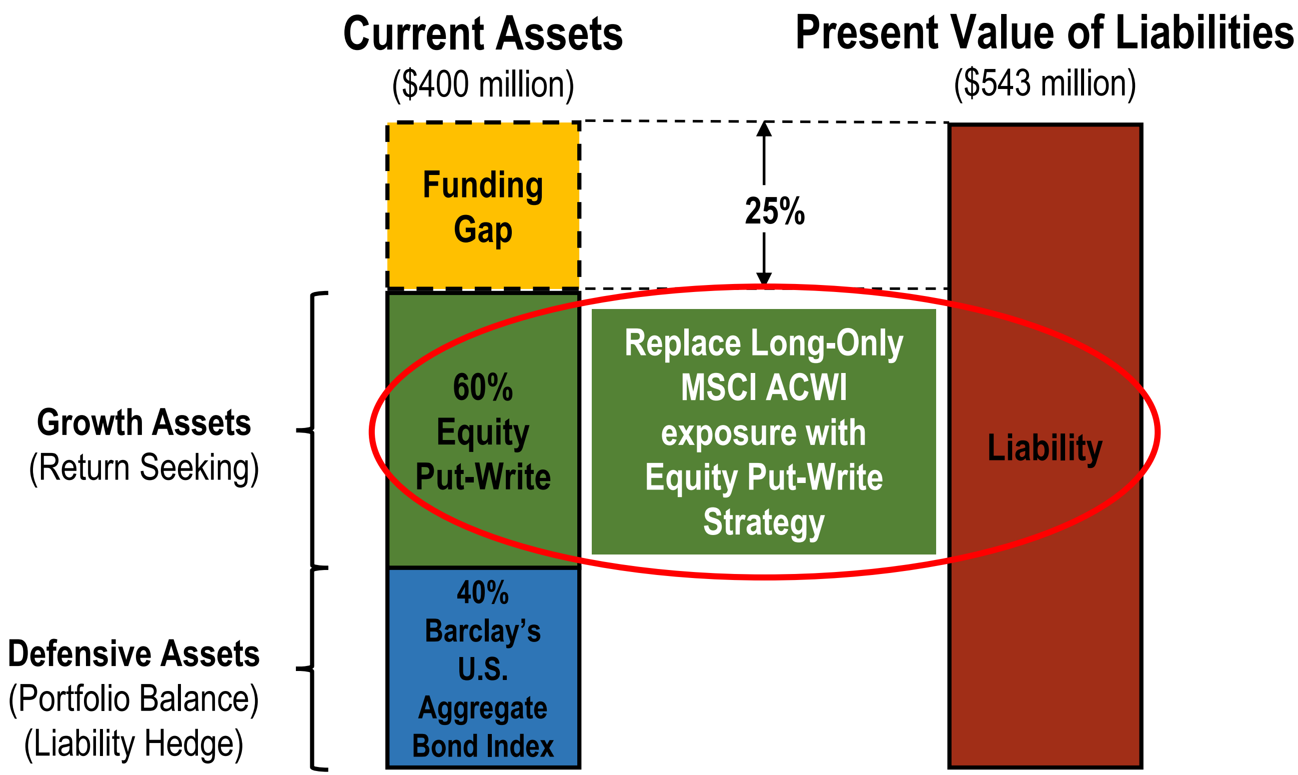
New Asset Allocation



- **Replace Global Equities in the portfolio with an Equity Put-Write strategy.**

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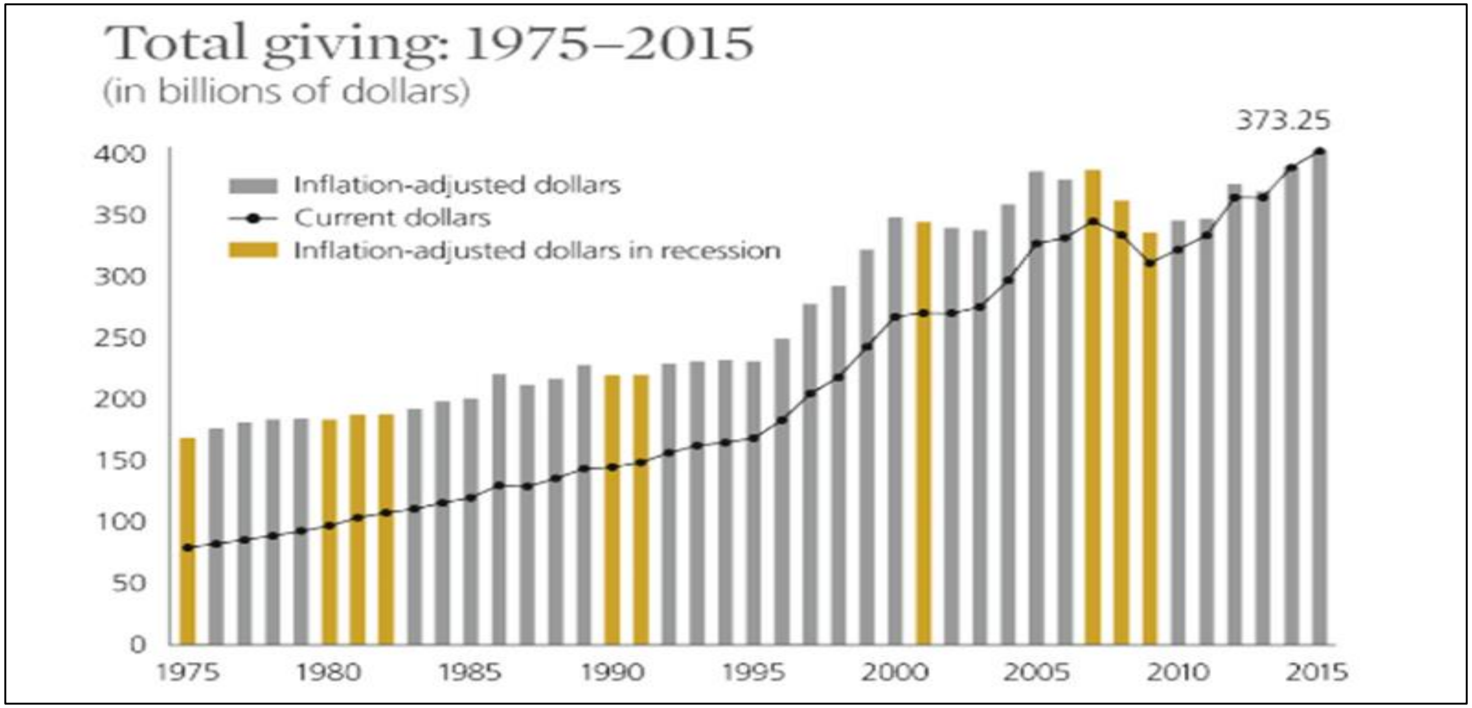
Institutional Liabilities

U.S. Charitable Giving



Source: Giving USA Foundation

- **It is not just pensions that face return challenges and "Enterprise Beta" that is greater than the market beta of their assets. Charitable giving also declines in periods of recession and market declines.**

Conclusion

- Funded Status ratios for Defined-Benefit Pensions are geared to interest rates and growth assets – factors that tend to be positively correlated

- Non-Profits face high return hurdles to meet spending goals combined with new gifts that are correlated with risk assets

- It is critical to maintain allocations equities for their high return expectations to have any chance of meeting liabilities

- Option strategies that reduce downside exposure – even at the expense of upside participation – without reducing return expectations, better align assets with the overall enterprise risk/liabilities of the institution