The Role of REITs and Listed Real Estate Equities in Target Date Fund Asset Allocations

February 2019 Update

(Data through December 2018)

Major Asset Classes and Benchmarks

Asset Class	Benchmark Index
Cash	Merrill Lynch 91-Day Treasury Bill Index
TIPS	Barclays Capital U.S. TIPS Index
U.S. Bonds	Barclays Capital U.S. Aggregate Index
High Yield	Merrill Lynch High Yield Master II Index
Non-U.S. Bonds	Citigroup Global Markets Non-U.S. Government Bond Index
Large Cap Equities	Wilshire U.S. Large-Cap Index^{SM}
Small Cap Equities	Wilshire U.S. Small-Cap Index^{SM}
U.S. REITs	FTSE NAREIT All Equity REITs Index
Global REITs	FTSE EPRA/NAREIT Global Developed Real Estate Index
Non-U.S. Developed Markets Equities	MSCI EAFE Index
Emerging Markets Equities	MSCI Emerging Markets Index
Commodities	S&P GSCI Total Index

Potential Diversification Benefits of REITs

Wilshire

Asset class correlations, 12/31/1975 to 12/31/2018*

	Barclays Capital U.S. Aggregate Index	Merrill Lynch High Yield Master II Index	Wilshire U.S. Large Cap Index	Wilshire U.S. Small Cap Index	FTSE NAREIT All Equity REITs Index	MSCI EAFE Index	MSCI Emerging Markets Index
Barclays Capital - U.S. Aggregate Index	1.00	0.24	0.20	0.13	0.19	0.15	0.03
Merrill Lynch - High Yield Master II Index	0.24	1.00	0.59	0.63	0.59	0.54	0.58
Wilshire U.S. Large Cap Index	0.20	0.59	1.00	0.88	0.58	0.65	0.67
Wilshire U.S. Small Cap Index	0.13	0.63	0.88	1.00	0.65	0.60	0.67
FTSE NAREIT - All Equity REITs Index	0.19	0.59	0.58	0.65	1.00	0.46	0.44
MSCI EAFE Index	0.15	0.54	0.65	0.60	0.46	1.00	0.70
MSCI Emerging Markets Index	0.03	0.58	0.67	0.67	0.44	0.70	1.00

Portfolio volatility can be reduced by adding assets that have low correlations with the assets currently in the portfolio. The long-term correlations of equity REITs with other major asset classes (highlighted in green) range from 0.19 to 0.65, signifying potential diversification benefits from adding REITs to an investment portfolio.

*Merrill Lynch High Yield Master II Index inception date is 9/30/1986 and MSCI Emerging Markets Index inception date is 1/31/1988

Source: Wilshire Compass

REITs as a Source of Inflation Protection

Percent of Periods in which Total Return Met or Exceeded Inflation
12/31/1975 to 12/31/2018*

	S&P GSCI Total Index	S&P 500 Index	FTSE NAREIT All Equity REITs Index	Barclays Capital U.S. Aggregate Index	Barclays Capital U.S. TIPS Index
6 month rolling returns	56%	70%	73%	66%	65%
12 month rolling returns	56%	76%	76%	73%	70%

REITs have historically provided superior inflation protection than fixed-income assets, equities and commodities; although commodities is often viewed as one of the most effective hedges against inflation.

*Barclays Capital U.S. TIPS Index inception is 10/1/1997
Source: Wilshire Compass; U.S. Department of Labor, Bureau of Labor Statistics

Mean Variance and Surplus Optimization

- Mean Variance Optimization (MVO) allocates assets to maximize portfolio returns while controlling for the variance of those returns.
- Surplus Optimization (SO) is a variant of MVO that takes the target liability – retirement income – into account. SO allocates assets to maximize the expected surplus return above the growth of the liability while controlling for expected surplus risk.
- Surplus Optimization tracks the value of the liability more closely than MVO and as a result minimizes shortfalls versus the target liability.
- When designing the glide path, elements of the asset allocations of both MVO and SO should play a role. For portfolios with medium- to long-term investment horizons, asset growth typically is most important, leading to a primary role for asset allocations using MVO. However, for portfolios with short- to medium-term investment horizons as well as portfolios for those in retirement, hedging retirement liabilities is most important, leading to a primary role for asset allocations using SO.

Globally Diversified Portfolios with U.S. REITs

December 1975 – December 2018

Asset Allocation Methodology	Expected Portfolio Risk	Annualized Portfolio Risk	Annualized Portfolio Return	Portfrolio Starting Value	Portfolio Ending Value
MVO w/o U.S. REITs	9.09%	9.59%	9.84%	$10,000	$565,805
MVO w/ U.S. REITs	9.09%	9.54%	9.97%	$10,000	$594,576
Surplus Opt w/ U.S. REITs	9.09%	9.41%	10.29%	$10,000	$674,162

The performance of the three portfolios shows that the third portfolio constructed using Surplus Optimization with U.S. REITs in the opportunity set yields the highest return and lowest level of risk.

Source: Barclays Capital Live, NAREIT, Wilshire Compass

Note: Simulated portfolios shown here have been constructed using indexes listed on Slide 2.

Globally Diversified Portfolios with U.S. REITs

	MVO w/out U.S. REITs	MVO w/ U.S. REITs	Surplus Opt w/ U.S. REITs
Cash	0.0%	0.0%	0.0%
TIPS	3.6%	2.9%	0.0%
U.S. Bonds	25.2%	27.5%	34.3%
High Yield	6.2%	3.8%	0.0%
Non-U.S. Bonds	4.9%	4.2%	3.8%
Large Cap	34.1%	33.9%	28.9%
Small Cap	6.9%	5.3%	1.0%
U.S. REITs	0.0%	3.3%	8.7%
Non-U.S. Dev'd Mkts	14.2%	14.0%	11.3%
EMG Mkts	4.8%	5.0%	12.1%
Commodities	0.0%	0.0%	0.0%

The portfolio constructed with Surplus Optimization also includes a higher allocation to REITs than the portfolio constructed with MVO (8.7% vs. 3.3%). Also interesting to note is that the increasing allocation to REITs is accompanied by shrinking or zero allocations to U.S. TIPS, U.S. High Yield Bonds and U.S. Small Cap Equities, indicating that REITs serve as a more efficient asset class for combining the investment attributes of high and stable income, long-term capital appreciation, and inflation protection.

Source: Barclays Capital Live, NAREIT, Wilshire Compass

Note: Simulated portfolios shown here have been constructed using indexes listed on Slide 2.

Globally Diversified Portfolio with Global Listed REITs

December 1975 – December 2018

Asset Allocation Methodology	Expected Portfolio Risk	Annualized Portfolio Risk	Annualized Portfolio Return	Portfolio Starting Value	Portfolio Ending Value
MVO w/o Global REITs	9.06%	9.57%	9.90%	$10,000	$579,885
MVO w/ Global REITs	9.06%	9.59%	9.94%	$10,000	$587,374
Surplus Opt w/ Global REITs	9.06%	9.53%	10.12%	$10,000	$630,766

Similar results are found when we expand the opportunity set to include Global Listed REITs instead of U.S. REITs. The portfolio constructed with Surplus Optimization including global listed REITs resulted in the highest return with a low risk level.

Source: Barclays Capital Live, NAREIT, Wilshire Compass

Note: Simulated portfolios shown here have been constructed using indexes listed on Slide 2.

Globally Diversified Portfolio with Global Listed REITs

	MVO w/out Global REITs	MVO w/ Global REITs	Surplus Opt w/ Global REITs
Cash	0.0%	0.0%	0.0%
TIPS	5.5%	4.6%	0.0%
U.S. Bonds	24.6%	26.6%	35.0%
High Yield	5.5%	3.8%	0.0%
Non-U.S. Bonds	4.5%	3.7%	3.2%
Large Cap	33.9%	33.9%	29.3%
Small Cap	5.9%	5.3%	2.3%
Global REITs	0.0%	3.2%	9.7%
Non-U.S. Dev'd Mkts	14.7%	13.8%	9.5%
EMG Mkts	5.4%	5.1%	11.1%
Commodities	0.0%	0.0%	0.0%

Again, the portfolio constructed with Surplus Optimization includes a higher allocation to Global Listed REITs than the portfolio constructed with MVO. Increasing allocations to REITs are accompanied by shrinking or zero allocations to U.S. TIPS, U.S. High Yield Bonds and U.S. Small Cap Equities, indicating that Global Listed REITs also serve as a more efficient asset class for combining the investment attributes of high and stable income, long-term capital appreciation, and inflation protection.

Source: Barclays Capital Live, NAREIT, Wilshire Compass
Note: Simulated portfolios shown here have been constructed using indexes listed on Slide 2.

Target Date Fund Portfolio with U.S. REITs

- Finally, we construct a TDF portfolio by introducing a glide path to the above portfolios. The glide path reallocates the portfolio over time as the investor moves closer to retirement.

- As with the static portfolios, the TDF portfolios constructed with Surplus Optimization and including U.S. REITs historically yielded the highest return and lowest risk.

Target Date Fund Portfolio with U.S. REITs

December 1975 – December 2018

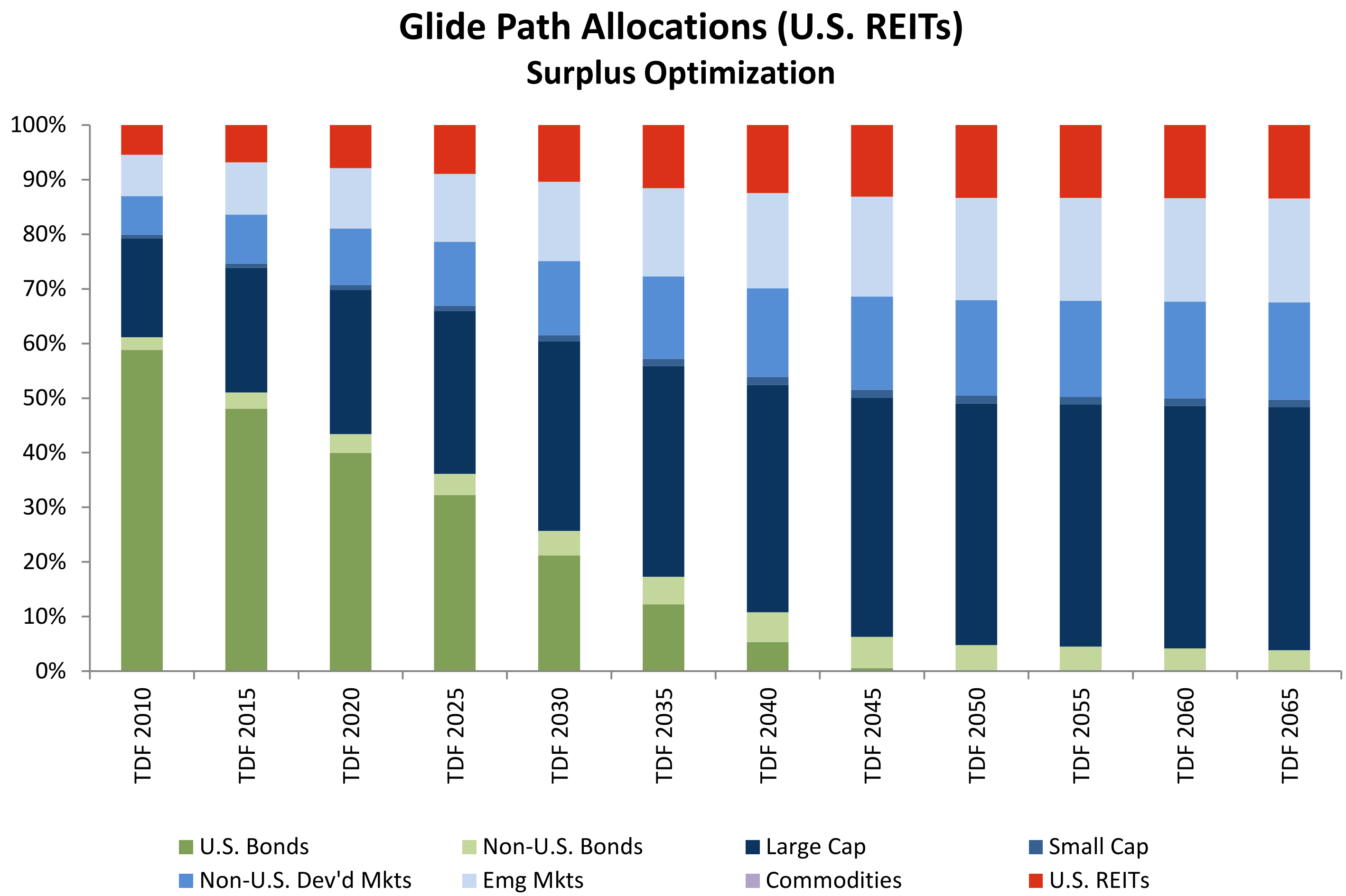
Asset Allocation Methodology	Annualized Portfolio Risk	Annualized Portfolio Return	Portfrolio Starting Value	Portfolio Ending Value
MVO w/o REITs	9.18%	10.01%	$10,000	$607,234
MVO w/ U.S. REITs	9.08%	10.13%	$10,000	$642,498
Surplus Opt w/ U.S. REITs	8.83%	10.31%	$10,000	$698,146

Introducing a glide path reduces risk levels across the board compared to the static portfolios. A TDF portfolio constructed with Surplus Optimization and including U.S. REITs has the highest return and lowest risk of the three TDF portfolios, returning 10.31% at a 8.83% risk level. Over the 40-plus-year investment period, the TDF portfolio using Surplus Optimization would have resulted in a portfolio value at the end of 2018 that is 14.97% higher than that of the MVO portfolio without U.S. REITs and 8.66% higher than that of the MVO portfolio including U.S. REITs.

Source: Barclays Capital Live, NAREIT, Wilshire Compass

Note: Simulated portfolios shown here have been constructed using indexes listed on Slide 2.

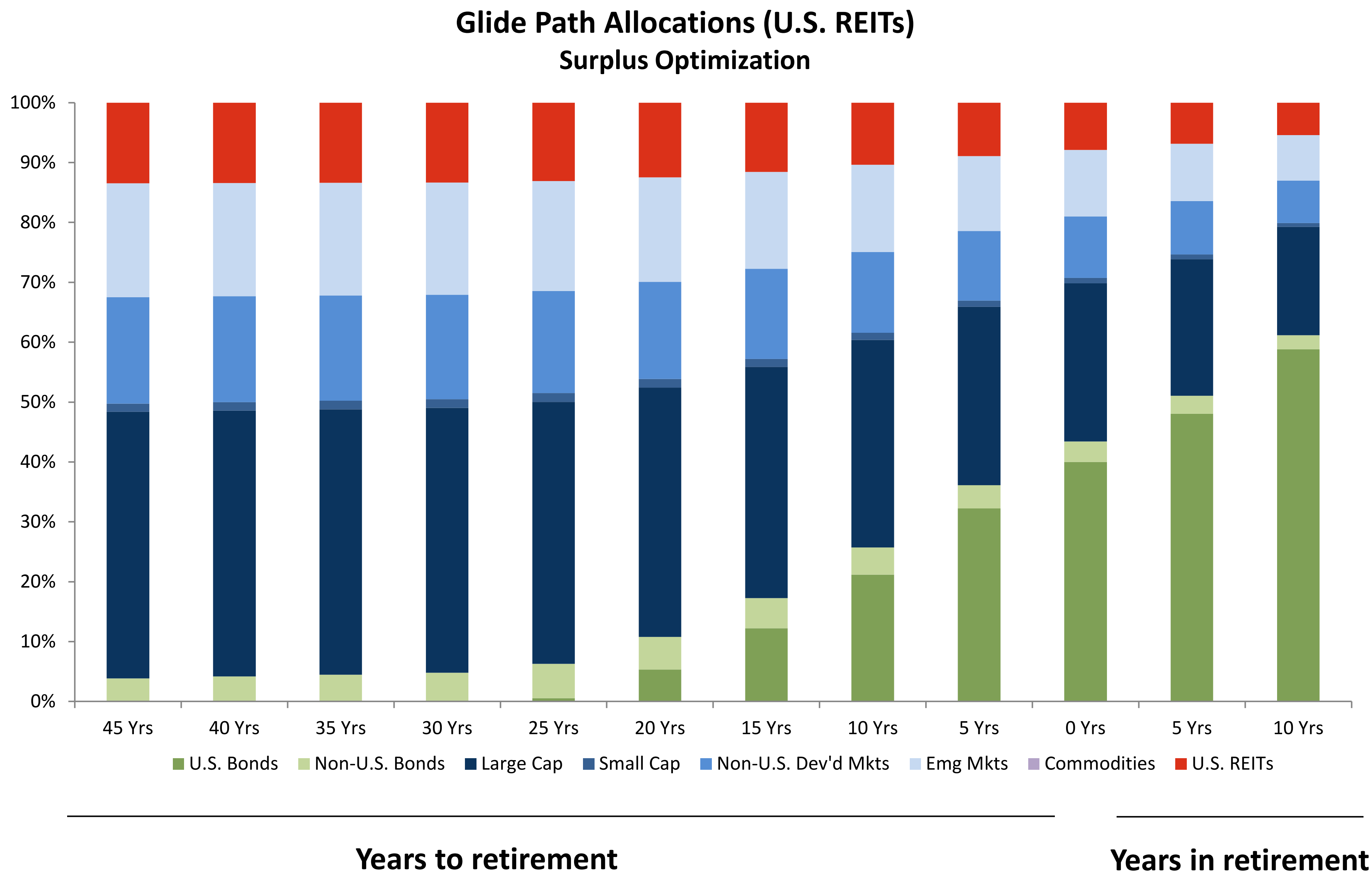
Target Date Fund Portfolio with U.S. REITs



U.S. REIT allocations in a TDF portfolio constructed with Surplus Optimization begin at 13.42% for an investor with a 40-year investment horizon (TDF 2060), gradually decline along with other equities as the investment horizon shortens, but remain sizeable at 7.91% for an investor at retirement (close to TDF 2020).

Source: Wilshire Compass

Glide Path Allocations (U.S. REITs)
Surplus Optimization



Source: Wilshire Associates – *The Role of REITs and Listed Real Estate Equities in Target Date Fund Allocations*. Large-cap stocks – Wilshire U.S. Large Cap Index; Small-cap stocks – Wilshire U.S. Small Cap Index; International stocks – Morgan Stanley Capital International Europe, Australasia, and Far East (EAFE®) Index; Emerging Market Equities – MSCI Emerging Markets Index; U.S. bonds - Barclays U.S. Aggregate Bond Index; Non-U.S. bonds – Citigroup Non-USD World GBI; U.S. REITs – FTSE NAREIT All Equity REIT Index.

Target Date Fund Portfolio with Global Listed REITs

December 1975 – December 2018

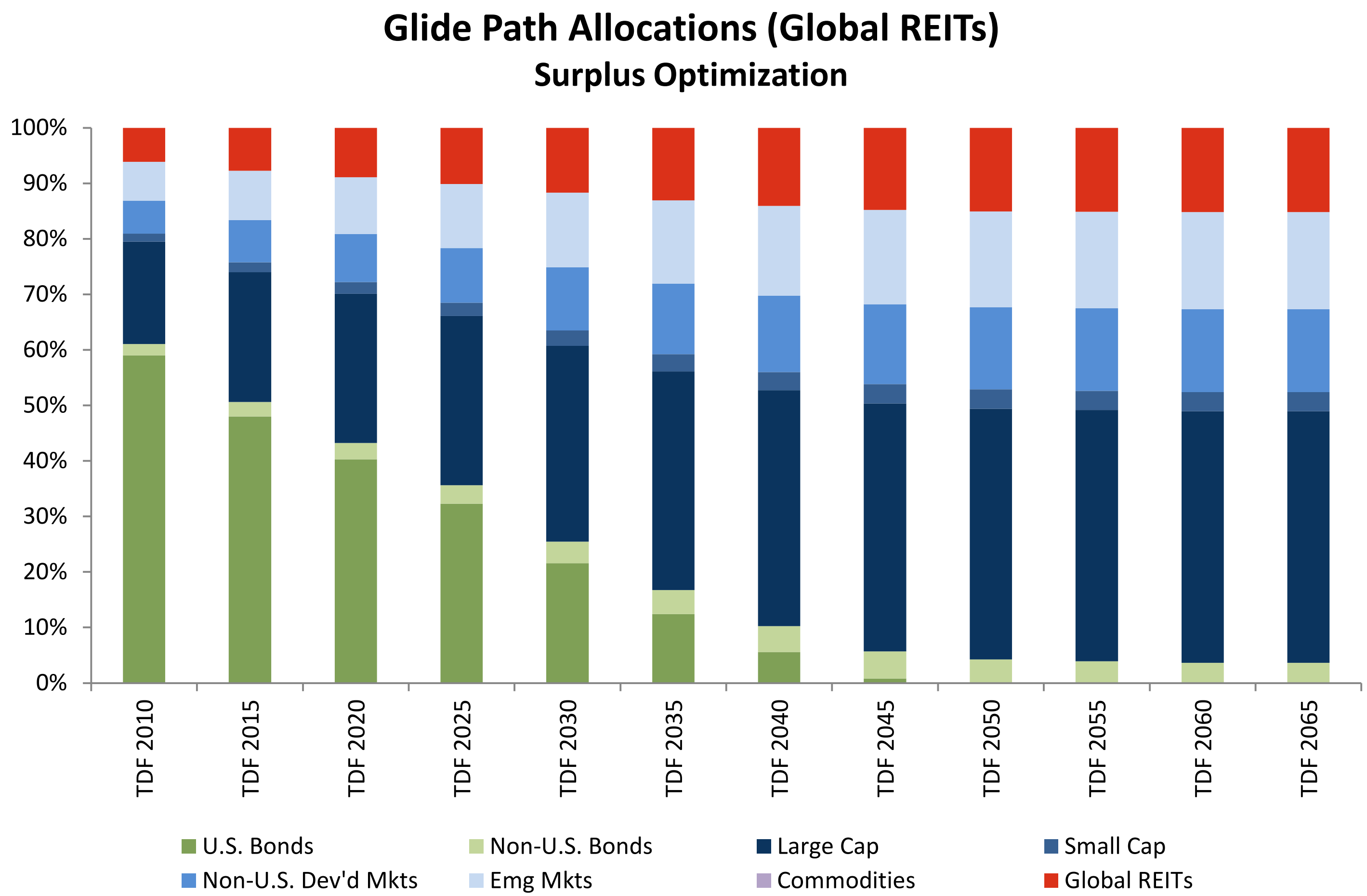
Asset Allocation Methodology	Annualized Portfolio Risk	Annualized Portfolio Return	Portfolio Starting Value	Portfolio Ending Value
MVO w/o Global REITs	9.17%	10.02%	$10,000	$610,935
MVO w/ Global REITs	9.15%	10.09%	$10,000	$629,315
Surplus Opt w/ Global REITs	9.02%	10.19%	$10,000	$659,379

Introducing a glide path again reduces risk levels compared with the static portfolios. A TDF portfolio constructed with Surplus Optimization and including Global Listed REITs has the highest return and lowest risk of the three TDF portfolios, returning 10.19% at a 9.02% risk level. Over the 40-year investment period, the TDF portfolio using Surplus Optimization would have resulted in a final portfolio value at the end of 2018 that is 7.93% higher than that of the MVO portfolio without Global Listed REITs and 4.78% higher than that of the MVO portfolio including Global Listed REITs.

Source: Barclays Capital Live, NAREIT, Wilshire Compass

Note: Simulated portfolios shown here have been constructed using indexes listed on Slide 2.

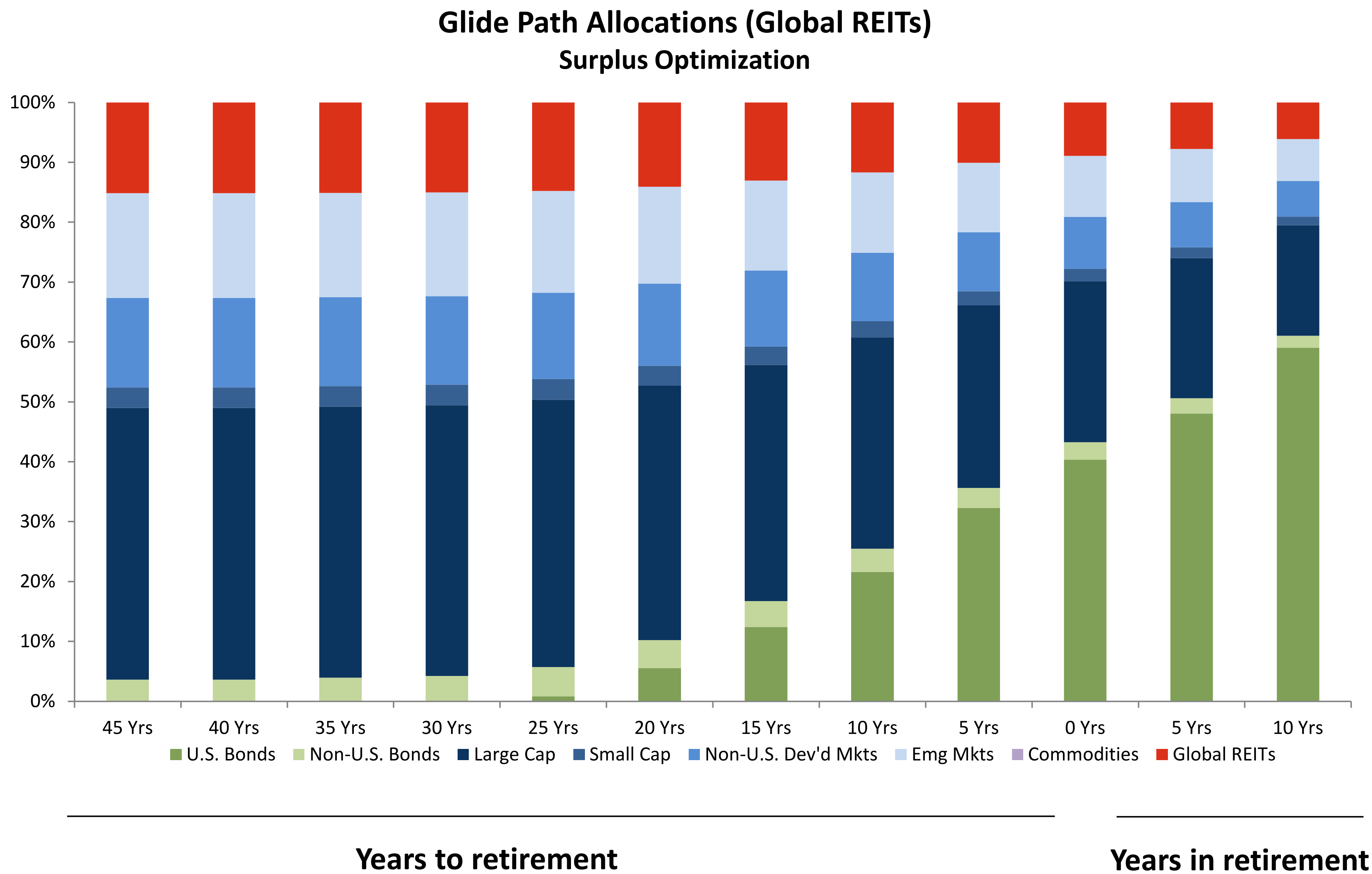
Target Date Fund Portfolio with Global REITs



Global REIT allocations in a TDF portfolio constructed with Surplus Optimization begin at 15.17% for an investor with a 40-year investment horizon (TDF 2060), gradually decline along with other equities as the investment horizon shortens, but remain sizeable at 8.90% for an investor at retirement (close to TDF 2020).

Source: Wilshire Compass

Glide Path Allocations (Global REITs) Surplus Optimization



Source: Wilshire Associates – *The Role of REITs and Listed Real Estate Equities in Target Date Fund Allocations*. TIPS – Barclays Capital U.S. TIPS Index; Large-cap stocks – Wilshire U.S. Large Cap Index; Small-cap stocks – Wilshire U.S. Small Cap Index; Non-U.S. Developed Mkts– Morgan Stanley Capital International Europe, Australasia, and Far East (EAFE®) Index; Emerging Market Equities – MSCI Emerging Markets Index; U.S. bonds - Barclays U.S. Aggregate Bond Index; Non-U.S. bonds – Citigroup Non-USD World GBI; Global REITs – FTSE EPRA/NAREIT Developed Real Estate Index.

Target Date Fund Portfolio
Selected Glide Path REIT Allocations

	TDF 2015	TDF 2025	TDF 2035	TDF 2045	TDF 2055	TDF 2060
MVO with U.S. REITs	1.32%	3.65%	6.63%	8.23%	8.51%	8.55%
SO with U.S. REITs	6.85%	8.93%	11.57%	13.10%	13.37%	13.42%
MVO with Global REITs	0.88%	3.60%	7.08%	9.02%	9.37%	9.37%
SO with Global REITs	7.75%	10.10%	13.07%	14.80%	15.11%	15.17%

Source: Wilshire Compass

Note: Simulated portfolios shown here have been constructed using indexes listed on Slide 2.

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