

# Target Date Asset Allocation

## A Goals-Based Approach



CHIEF INVESTMENT OFFICE

WINTER 2019

### 1. EXECUTIVE SUMMARY

The Global Wealth & Investment Management (GWIM) provides financial guidance and investment solutions to individuals, businesses, governments and institutions. As a leader in the retirement business, we work with millions of individual investors and integrated benefit participants to assist them in achieving retirement and financial success. We have leveraged our expertise in goals-based investing to develop an innovative approach to target-date or “life cycle” investing.

A Target Date Asset Allocation is a long-term investment for an individual with a specific retirement date in mind. As the target date approaches, the allocation gradually shifts the investor’s holdings toward lower-risk investments. Our Target Date Asset Allocation applies a goals-based approach to arrive at suitable allocations across a participant’s investment horizon. The guidance is sensitive to varying assumptions regarding risk tolerance, retirement age, current age, years in retirement, inflation and capital market assumptions.

It is important that participants are aware of the advantages and disadvantages of using the Target Date Asset Allocation approach. The advantages include having a simple source for gaining access to a diversified portfolio that is actively rebalanced over time, shifting from aggressive to conservative allocations as the participant approaches retirement. The disadvantage of the approach is that it cannot be customized to suit every investor’s individual situation. For more details regarding the risks associated with target date allocations refer to Section 3 (vii) page 8.

This document outlines the principles and methodology we used to develop our Target Date Asset Allocation approach and key results.

**Anil Suri**, Managing Director  
**Nevenka Vrdoljak**, Director  
**Yong Liu**, Director  
**Run Zhang**, Assistant Vice President

### SUMMARY

Our Target Date Asset Allocation methodology applies a goal-based approach to arrive at suitable allocations at different time horizons.

This document outlines the principles and methodology we used to develop our Target Date Asset Allocation approach and key results.

Our Target Date Asset Allocations have changed due to updates to CIO Capital Market Assumptions.

The retirement allocation is developed based on the idea that the primary concern of retirees is not outliving their wealth.

<b>Are Not FDIC Insured</b>	<b>Are Not Bank Guaranteed</b>	<b>May Lose Value</b>
<b>Are Not Deposits</b>	<b>Are Not Insured by Any Federal Government Agency</b>	<b>Are Not a Condition to Any Banking Service or Activity</b>

---

## TABLE OF CONTENTS

<b>1. EXECUTIVE SUMMARY</b> .....	<b>1</b>	<b>4. RETIREMENT INVESTING APPROACH</b> .....	<b>9</b>
<b>2. TARGET DATE ASSET ALLOCATIONS</b> .....	<b>3</b>	<b>5. REFERENCES</b> .....	<b>10</b>
i. What is a Target Date Asset Allocation?.....	3	APPENDIX I : PREVIOUS YEAR'S TARGET DATE ASSET	
ii. Our Target Date Asset Allocations.....	3	ALLOCATIONS.....	11
iii. Our Target Date Assumptions .....	5		
iv. Target Date Glide Path Representation .....	5		
<b>3. TARGET DATE ASSET ALLOCATION METHODOLOGY</b> .....	<b>6</b>		
i. Goals-Based Approach: Framework and theory.....	6		
ii. Goals-Based Approach: Risk-adjusted discounting.....	6		
iii. Goals-Based Approach: Multi-period single goals			
and lockbox separation .....	6		
iv. Goals-Based Approach: Assumptions .....	6		
v. Input: Capital market assumptions.....	7		
vi. Impact of varying assumptions.....	7		
vii. Risks associated with target date asset			
allocation investing .....	8		

## 2. TARGET DATE ASSET ALLOCATIONS

### i. What is a Target Date Asset Allocation?

A Target Date Asset Allocation is designed to be a long-term investment for an individual with a specific retirement date in mind. For example, a 2030 target date allocation is constructed to accommodate the investment needs of someone planning to retire in that year. In our view, target date allocations make it easier to invest for retirement by automatically rebalancing weights and gradually shifting an investor's asset allocation toward lower-risk investments as the target retirement date approaches.

Although constructed according to portfolio management best practices, target date allocations entail risk. The allocations have material exposure to equities, even once the target retirement date is reached. The CIO 2020 target date allocation, for example, has a 56% allocation to equities. This is because someone retiring in 2020 has a substantial chance of living another two or three decades and therefore still could have a relatively long time horizon. However, it is important to note that our methodology will only shift an investor's asset allocation toward lower risk investments up to their retirement date. So while a 37% allocation to equities may be appropriate for someone at their retirement date, we believe investors entering retirement should re-evaluate their investment strategy in the context of a broader financial plan. For further detailed discussion regarding options available to investors once a target date has been reached, refer to Section 4 page 9.

Target Date Asset Allocations, even if they share the same target date, may have very different investment strategies and risks. They do not guarantee that you will have sufficient retirement income at the target date, and you can lose money, including at or after the target date. Target date allocations do not eliminate the need for you to decide, before investing and from time to time thereafter, whether the fund fits your risk tolerance, personal circumstances and complete financial situation. As a result, investors should not solely rely on their age or retirement date when selecting a target date allocation.

### ii. Our Target Date Asset Allocations

The Target Date Asset Allocations are shown in Tables 1 and 2. Table 1 is intended for use by plans with standard or core investment asset classes. Table 2 is intended for use by plans with both core and additional fixed income sub-asset classes.

As a result of the CIO annual review process, the allocations have changed from the Target Date Asset Allocations provided last year (see Appendix I). The changes have resulted in an increase on average of two percentage points in equity allocations across the retirement, 2020 to 2060 allocations. The changes are due to updates in CIO Capital Market Assumptions (see Section 3).

**Table 1:** Target Date Asset Allocations (Set I)

Asset Class	Target Date Asset Allocations (Set I)									
	Retirement	2020	2025	2030	2035	2040	2045	2050	2055	2060
U.S. Large Cap Growth	8%	13%	14%	16%	18%	20%	21%	21%	21%	21%
U.S. Large Cap Value	14%	19%	24%	26%	30%	31%	32%	32%	32%	32%
U.S. Small Cap Growth	1%	2%	2%	3%	3%	3%	4%	4%	4%	4%
U.S. Small Cap Value	1%	2%	2%	3%	3%	3%	4%	4%	4%	4%
International Developed Equity	9%	14%	15%	17%	19%	21%	22%	22%	22%	22%
Emerging Markets	4%	6%	7%	8%	8%	9%	10%	10%	10%	10%
Fixed Income	61%	42%	34%	25%	17%	11%	5%	5%	5%	5%
Cash	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
<b>Percent Equity</b>	<b>37%</b>	<b>56%</b>	<b>64%</b>	<b>73%</b>	<b>81%</b>	<b>87%</b>	<b>93%</b>	<b>93%</b>	<b>93%</b>	<b>93%</b>
<b>Percent Fixed Income</b>	<b>63%</b>	<b>44%</b>	<b>36%</b>	<b>27%</b>	<b>19%</b>	<b>13%</b>	<b>7%</b>	<b>7%</b>	<b>7%</b>	<b>7%</b>
<b>Expected Arith. Avg. Return (Annl.)<sup>1</sup></b>	<b>5.8%</b>	<b>6.8%</b>	<b>7.2%</b>	<b>7.7%</b>	<b>8.1%</b>	<b>8.3%</b>	<b>8.7%</b>	<b>8.7%</b>	<b>8.7%</b>	<b>8.7%</b>
<b>Expected Geo. Avg. Return (Annl.)<sup>1</sup></b>	<b>5.6%</b>	<b>6.3%</b>	<b>6.6%</b>	<b>6.9%</b>	<b>7.2%</b>	<b>7.3%</b>	<b>7.5%</b>	<b>7.5%</b>	<b>7.5%</b>	<b>7.5%</b>
<b>Expected Volatility (Annl.)<sup>1</sup></b>	<b>7.4%</b>	<b>10.0%</b>	<b>11.3%</b>	<b>12.8%</b>	<b>14.1%</b>	<b>15.1%</b>	<b>16.2%</b>	<b>16.2%</b>	<b>16.2%</b>	<b>16.2%</b>

Source: Chief Investment Office. Please note that Chief Investment Office may modify the intended percentage allocations.

<sup>1</sup> Note: The expected return and volatility are based on CIO Capital Market Assumptions, 2019.

Allocations as of January 2019.

This chart is intended for illustrative purposes only and is not intended to be representative of the past or future performance of any particular investment. Actual rates of return cannot be predicted and will fluctuate. Asset allocation cannot eliminate the risk of fluctuating prices and uncertain returns. Please note that asset classes are represented by indexes.

Note: The arithmetic mean, a simple average, provides an unbiased estimate of an uncertain variable such as future returns. If, however, when we seek to estimate future compound returns, the more appropriate measure is the geometric mean return. This is the return that, when compounded over the period of time in question, produces the actual realized cumulative return. The arithmetic return of a variable will always be greater than or equal to its geometric return. The greater the volatility, the wider the gap between the arithmetic and geometric returns.

Volatility, which reflects future return expectations, is measured as the standard deviation of annual returns. Standard deviation is a common statistical measure that conveys the deviation of a variable (such as asset returns) around its mean.

**Please refer to the end of the paper for Asset Class Disclosures and Index Definitions.**

Table 2 provides the Target Date Asset Allocations (Set II) for a more granular depiction of the style allocation, including

specific percentages associated with fixed income concentrations.

**Table 2:** Target Date Asset Allocations (Set II)

Asset Class	Target Date Asset Allocations (Set II)									
	Retirement	2020	2025	2030	2035	2040	2045	2050	2055	2060
U.S. Large Cap Growth	8%	13%	14%	16%	18%	20%	21%	21%	21%	21%
U.S. Large Cap Value	14%	19%	24%	26%	30%	31%	32%	32%	32%	32%
U.S. Small Cap Growth	1%	2%	2%	3%	3%	3%	4%	4%	4%	4%
U.S. Small Cap Value	1%	2%	2%	3%	3%	3%	4%	4%	4%	4%
International Developed Equity	9%	14%	15%	17%	19%	21%	22%	22%	22%	22%
Emerging Markets	4%	6%	7%	8%	8%	9%	10%	10%	10%	10%
U.S. Government	17%	13%	10%	8%	5%	3%	2%	2%	2%	2%
U.S. Mortgages	15%	10%	8%	6%	4%	3%	1%	1%	1%	1%
U.S. Corporates	16%	14%	11%	8%	6%	3%	2%	2%	2%	2%
U.S. High Yield	4%	3%	3%	2%	1%	1%	0%	0%	0%	0%
International Fixed Income	9%	2%	2%	1%	1%	1%	0%	0%	0%	0%
Cash	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
<b>Percent Equity</b>	<b>37%</b>	<b>56%</b>	<b>64%</b>	<b>73%</b>	<b>81%</b>	<b>87%</b>	<b>93%</b>	<b>93%</b>	<b>93%</b>	<b>93%</b>
<b>Percent Fixed Income</b>	<b>63%</b>	<b>44%</b>	<b>36%</b>	<b>27%</b>	<b>19%</b>	<b>13%</b>	<b>7%</b>	<b>7%</b>	<b>7%</b>	<b>7%</b>
<b>Expected Arith. Avg. Return (Annl.)*</b>	<b>6.0%</b>	<b>6.8%</b>	<b>7.2%</b>	<b>7.6%</b>	<b>8.0%</b>	<b>8.2%</b>	<b>8.5%</b>	<b>8.5%</b>	<b>8.5%</b>	<b>8.5%</b>
<b>Expected Geo. Avg. Return (Annl.)*</b>	<b>5.7%</b>	<b>6.4%</b>	<b>6.7%</b>	<b>6.9%</b>	<b>7.2%</b>	<b>7.3%</b>	<b>7.4%</b>	<b>7.4%</b>	<b>7.4%</b>	<b>7.4%</b>
<b>Expected Volatility (Annl.)*</b>	<b>7.2%</b>	<b>9.7%</b>	<b>10.8%</b>	<b>12.1%</b>	<b>13.3%</b>	<b>14.3%</b>	<b>15.2%</b>	<b>15.2%</b>	<b>15.2%</b>	<b>15.2%</b>

Source: Chief Investment Office. Please note that Chief Investment Office may modify the intended percentage allocations.

1 Note: Expected return and risk is based on CIO Capital Market Assumptions, 2019.

Allocations as of January, 2019.

This chart is intended for illustrative purposes only and is not intended to be representative of the past or future performance of any particular investment. Actual rates of return cannot be predicted and will fluctuate. Asset allocation cannot eliminate the risk of fluctuating prices and uncertain returns. Please note that asset classes are represented by indexes.

Note: The arithmetic mean, a simple average, provides an unbiased estimate of an uncertain variable such as future returns. If, however, when we seek to estimate future compound returns, the more appropriate measure is the geometric mean return. This is the return that, when compounded over the period of time in question, produces the actual realized cumulative return. The arithmetic return of a variable will always be greater than or equal to its geometric return. The greater the volatility, the wider the gap between the arithmetic and geometric returns.

Volatility, which reflects future return expectations, is measured as the standard deviation of annual returns. Standard deviation is a common statistical measure that conveys the deviation of a variable (such as asset returns) around its mean.

**Please refer to the end of the paper for Asset Class Disclosures and Index Definitions.**

### iii. Our Target Date assumptions

The table below provides the model assumptions used to develop the Target Date Asset Allocations.

and specifies the relationship between the Target Date Assumptions and the Target Date Asset Allocation Methodology.

Section 3 details the assumptions outlined within the chart below

**Table 3:** Target Date Model Assumptions for 2019

Target Date Model Assumptions for 2019	
Parameter	Assumption/Input
Capital Market Assumptions (CMAs)	CIO 2019 CMAs
Allocation constraints	CIO SAA Tier 0 Efficient Frontier <sup>1</sup>
Inflation	2.28%
Confidence level (CL)	Beginning =75%; Ending = convergence to the Moderate risk profile
Starting age	Age 23
Retirement age	Age 65
Years in retirement	26 Years <sup>2</sup>
Retirement allocation	Systematic Withdrawal Rate at age 65 90% level of confidence

<sup>1</sup> The allocations under consideration are obtained from the efficient frontier generated by the investment profile of the Strategic Asset Allocation (Tier 0 Level 2). The efficient frontier is the set of portfolios that offers the highest expected return for a defined level or the lowest risk for a given level of expected return. Tier 0 (highest liquidity): Highest liquidity needs with none of the portfolio invested in less liquid alternative asset categories.

<sup>2</sup> Based on reference to IRS single life expectancy table + 5 years. Table I in Appendix B in Publication 590-B at [irs.gov/pub/irs-pdf/p590b.pdf](https://www.irs.gov/pub/irs-pdf/p590b.pdf) (page 46).

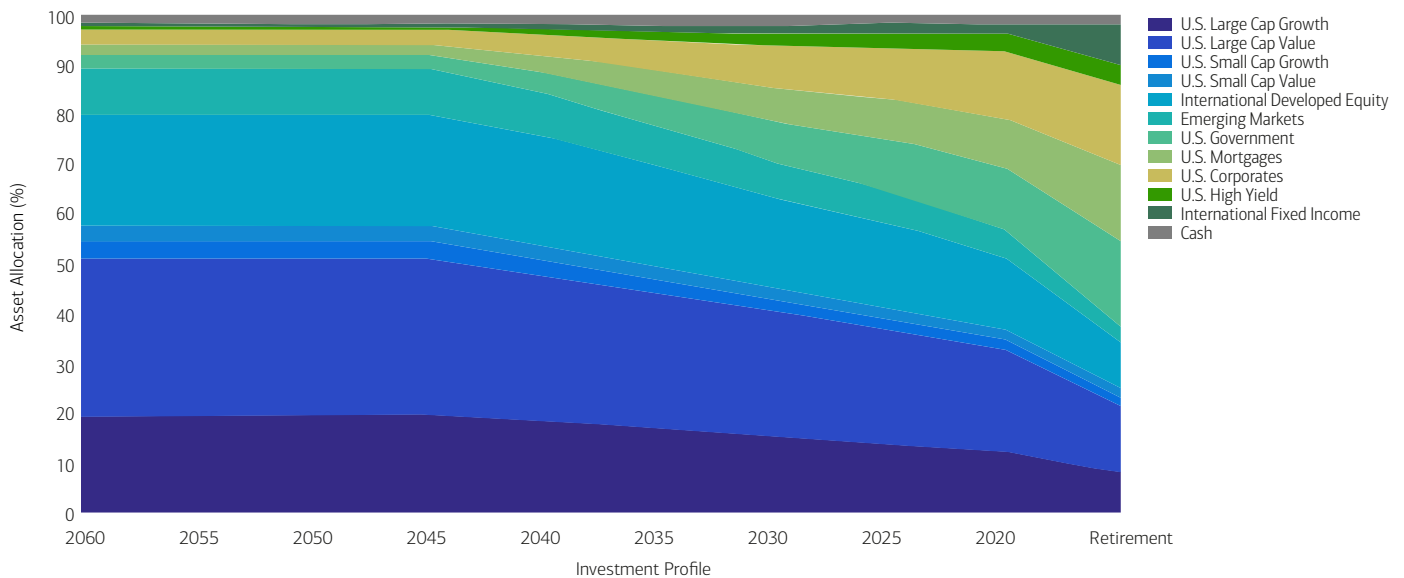
Source: Chief Investment Office.

### iv. Target date glide path representation

Exhibit 1 depicts the Target Date Asset Allocation Glide

Path, showing how the allocations are expected to change as retirement nears.

**Exhibit 1:** Target Date Asset Allocation Glide Path



Source: Chief Investment Office. For illustrative purposes only.

### 3. TARGET DATE ASSET ALLOCATION METHODOLOGY

#### i. Goals-Based Approach: Framework and theory

The mean-variance framework developed in Markowitz's (1952) groundbreaking paper, "Portfolio Selection," has in recent decades become the workhorse model for wealth and investment managers. In this framework, each investor weighs the expected return on her overall portfolio against its variance (or standard deviation) to identify the efficient portfolio that delivers the highest expected return for the level of risk the investor is willing to bear.

The approach takes no explicit account of whether the portfolio helps the investor achieve her goals. It also fails to account for the array of well-documented behavioral propensities that individuals exhibit. The approach is appropriate for investors who seek to achieve all their goals by investing in a single mean-variance efficient portfolio. However, as Thaler (1985) suggests, investors typically do not focus on overall portfolio performance. Rather, they are prone to mental accounting and to making investment decisions based on the specific goal to be met.

An emerging consensus in the wealth management industry favors a goals-based approach to advising clients on asset allocation and wealth management: see Brunel (2003, 2006) and Nevin (2004).

Under the goals-based wealth management framework, investors first specify their goals and priorities. Each investment goal with its associated "subportfolio problem" is treated separately and solved independently. Because each goal is likely to be met with some acceptable degree of uncertainty, investors may be less prone to overreact to extreme market conditions.

#### ii. Goals-Based Approach: Risk-adjusted discounting

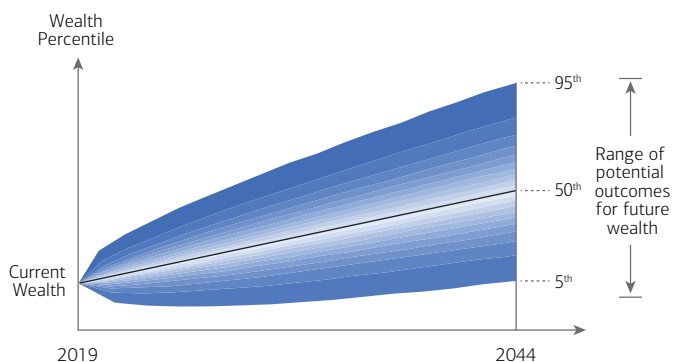
The key intuition of the goals-based approach (Wang, Suri, Laster, & Almadi, 2011) is "risk-adjusted discounting". Given:

- A single cash-flow goal defined by a time horizon  $T$ , confidence level  $1-\alpha$ , target amount  $W$  and,
- An available investment asset with expected return  $\mu$  and volatility  $s$ . The estimated initial wealth required to invest in the selected asset to achieve the target wealth for the desired time horizon and confidence level, is computed as below (illustrated in Exhibit 2):

$$\text{Est. Initial Wealth} = W * \exp\left(-\left(\mu - \frac{1}{2}\sigma^2\right)T - \Phi^{-1}(\alpha)\sigma\sqrt{T}\right)$$

where  $\Phi^{-1}$  denotes the inverse cumulative distribution function of the standard normal distribution.

**Exhibit 2:** Potential Wealth Projection of Goals



Source: Chief Investment Office. For illustrative purposes only. This may not reflect any specific investor's facts or circumstances.

#### iii. Goals-Based Approach: Multi-period single goals and lockbox separation

Consider a goal requiring a stream of annual cash flows with a pre-specified confidence level. Sharpe (2007) develops the lockbox separation concept for this in a complete discrete time market, in which each goal is treated separately. It is argued in (Wang, Suri, Laster, & Almadi, 2011) that the optimal solution to the investment decision problem is the sum of the optimal solutions corresponding to the investment problems in which each cash flow requirement is treated separately.

For example, an investor would like to receive a series of annual pre-specified cash-flows over 30 years following retirement, with the pre-specified confidence level assigned to each cash-flow. The solution to this problem is a decomposition of the goal into 30 separate single cash-flow goals. Then the optimal solution is just the sum of 30 solutions to the single period goal problems.

#### iv. Goals-Based Approach: Assumptions

**Lockbox Separation.** Each cash-flow within each goal is treated separately. In our view, this is a reasonable assumption, based on similar arguments as made by (Sharpe, 2007), where it was argued that in a complete discrete market any strategy can be implemented by dividing initial wealth among a series of "lockboxes," each designed to fund spending at a particular date using a predetermined investment strategy for managing the funds until that date. It is also a realistic assumption, since it is natural to think about segregating the assets based on desired goals.

**Geometric Brownian Motion.** Asset returns are assumed to follow Geometric Brownian Motion (GBM). We believe this is a reasonable assumption, which is widely used throughout the financial industry as outlined in (Marathe & Ryan., 2005).

**Continuous Rebalancing.** The model assumes that asset allocations are maintained at a pre-determined fixed level through continuous rebalancing.

## v. Input: Capital market assumptions

A key input to deriving the Target Date Asset Allocations are the CIO Capital Market Assumptions. The assumptions are long-term views on a set of asset classes (shown in Table 4). More specifically, they provide estimates of expected returns and volatility for each asset class, as well as correlations among the asset classes, for a 25-year planning horizon.

To develop the Capital Market Assumptions, the CIO uses a proprietary model that is guided by economic theory. The model reflects the dynamic interrelationships between asset class returns and a set of financial risk factors.

The model is based on the principle that long-term returns provide compensation for exposure to risk factors. Risky assets (such as stocks) tend to have higher expected returns than safe assets (such as Treasury bills). To develop the Capital Market Assumptions, for each asset class, we identify risk factors that we believe help explain returns. Each of the risk factors along with the market indices used as proxies for them:

- has been found in academic research to represent systematic sources of risk
- exhibits a significant risk premium that is expected to persist in the future, and
- has extensive historical data available.

Historical data is used to estimate the empirical relationship between each asset class and the risk factors. For each asset class, some factors will be relevant to return performance and others not.

Taking current market conditions such as interest rates and equity market valuation levels as a starting point, the model simulates the future value of the risk factors based on the dynamics among them. Then, based on these values, it simulates future asset class returns. Finally, it uses the simulation results to estimate the expected returns and the volatility of returns for each asset class, as well as return correlations.

This simulation-based approach captures several important aspects of returns. In particular, the Capital Market Assumptions:

- allow for risk factors that vary over the planning horizon
- may deviate from historical averages, and
- capture current market conditions as they evolve in simulations.

Because of this, the CIO reviews the Capital Market Assumptions every year. In the reviews, historical data is first updated to reflect the financial and economic developments of the past year. Then, the updated Capital Market Assumptions are generated using a CIO proprietary model and the GWIM Investment Strategy Committee reviews and votes on them.

**Table 4:** Asset Class Assumptions

Asset Class	Geometric Return	Arithmetic Return	Volatility
<b>Inflation</b>	2.3%	2.3%	2.1%
<b>Equity</b>			
U.S. Large Cap Growth	6.1%	7.6%	18.1%
U.S. Large Cap Value	8.8%	10.0%	16.4%
U.S. Small Cap Growth	7.2%	9.3%	21.9%
U.S. Small Cap Value	9.7%	11.5%	20.6%
International Developed Equity	5.8%	7.8%	20.9%
Emerging Markets	5.8%	8.6%	24.9%
<b>Fixed Income</b>			
U.S. Government	3.6%	3.7%	5.9%
U.S. Mortgages	3.9%	4.2%	7.4%
U.S. Corporates	4.5%	4.8%	8.3%
U.S. High Yield	6.1%	6.7%	11.2%
International Fixed Income	3.8%	3.9%	5.1%
<b>Cash</b>	2.5%	2.5%	2.5%

This chart is intended for illustrative purposes only and is not intended to be representative of the past or future performance of any particular investment. Actual rates of return cannot be predicted and will fluctuate. Asset allocation cannot eliminate the risk of fluctuating prices and uncertain returns. Please note that asset classes are represented by indexes.

Note: The arithmetic mean, a simple average, provides an unbiased estimate of an uncertain variable such as future returns. If, however, when we seek to estimate future compound returns, the more appropriate measure is the geometric mean return. This is the return that, when compounded over the period of time in question, produces the actual realized cumulative return. The arithmetic return of a variable will always be greater than or equal to its geometric return. The greater the volatility, the wider the gap between the arithmetic and geometric returns. Volatility, which reflects future return expectations, is measured as the standard deviation of annual returns. Standard deviation is a common statistical measure that conveys the deviation of a variable (such as asset returns) around its mean.

**Please refer to the end of the paper for Asset Class Disclosures and Index Definitions.**

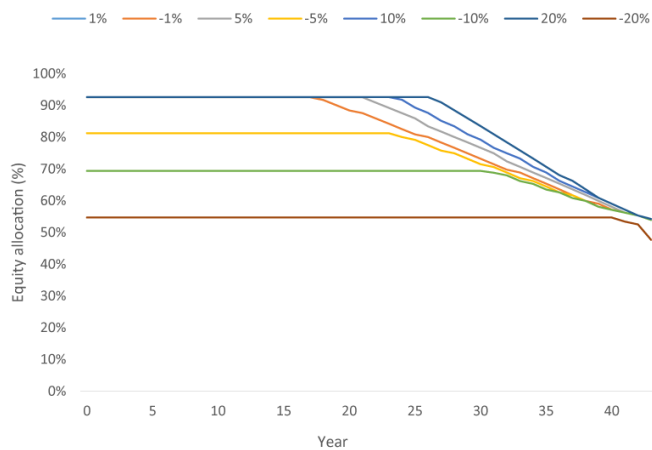
Source: Chief Investment Office, Data as of January 2019

## vi. Impact of varying assumptions

### (a) How different assumptions generate different equity allocations: Expected asset class returns

A key input to our Target Date Asset Allocations are the asset class assumptions shown in Table 4. Exhibit 3 at the top of the next page shows the sensitivity and stress test results for varying changes in the expected returns. The equity glide path is not sensitive to small changes, however, it is generally sensitive to large negative stress scenarios.

**Exhibit 3: Sensitivity Analysis: Expected returns**

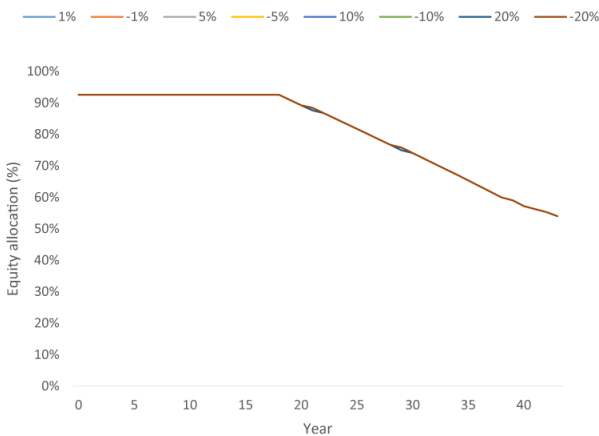


Source: Chief Investment Office.

**(b) How different assumptions generate different equity allocations: Inflation rate**

An input to our Target Date Asset Allocations is the inflation rate. Exhibit 4 below shows the sensitivity and stress test results for varying changes in the inflation rate. The equity glide path is not sensitive to changes in the inflation rate.

**Exhibit 4: Sensitivity Analysis: Inflation rate**

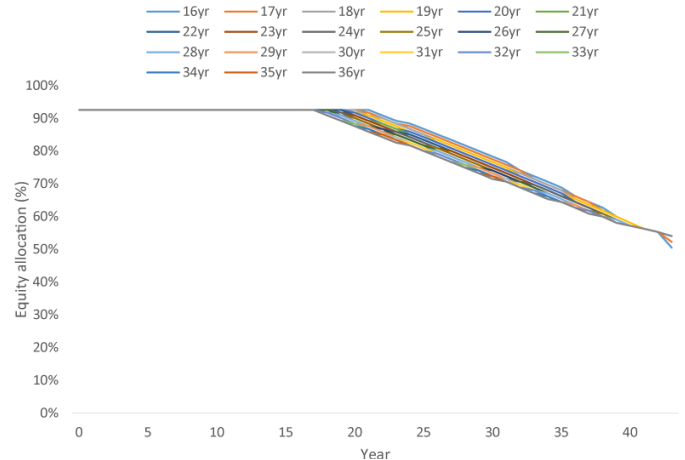


Source: Chief Investment Office.

**(c) How different assumptions generate different equity allocations: Years in retirement**

Our Target Date Asset Allocations assumes the time in retirement is 26 years. Exhibit 5 shows the sensitivity test results for changes to the years in retirement. The equity glide path is not sensitive to changes in the years in retirement.

**Exhibit 5: Sensitivity Analysis: Years in retirement**

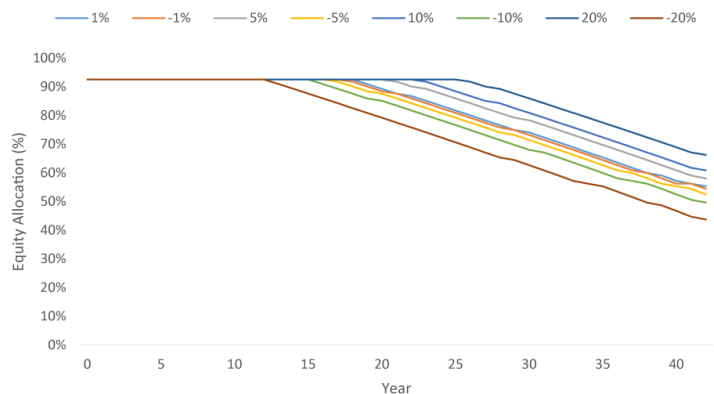


Source: Chief Investment Office.

**(d) How different assumptions generate different equity allocations: Ending equity weight**

Our Target Date Asset Allocations assumes the ending equity weight is equal to the moderate risk allocation of 55%. Exhibit 6 below shows the sensitivity and stress test results for changes to the ending equity weight. The equity glide path is not sensitive to changes in the ending equity weight.

**Exhibit 6: Sensitivity Analysis: Ending equity weight**



Source: Chief Investment Office.

**vii. Risks associated with Target Date Asset Allocation investing**

It is important that sponsors and participants are also aware of the risks associated with the Target Date Asset Allocation approach to investing for retirement. These include:

- The approach assumes that enrolled plan participants opting into the same target-date investment options have the same needs, regardless of potentially varied retirement goals.



- As demonstrated in Section 3 (vi) “Impact of varying assumptions,” allocations are sensitive to changes in parameters including expected return and ending equity weight.
- Investors should understand that investments in Target Retirement Funds are subject to the risks of their underlying funds.
- Asset allocation for equivalent target date allocations vary widely among firms.
- Tactical asset allocation views could be inconsistent with predefined target date asset allocations.

#### 4. RETIREMENT INVESTING APPROACH

The preceding discussion has focused on guidance for the accumulation phase of lifecycle investing. Suri and Vrdoljak (2018) discussed several common pitfalls to which participants should be alerted as they prepare for retirement. Chief among these concerns is taking too little risk in retirement and potentially falling short of necessary growth to fund a longer retirement period.

Once the target date has been reached, a different strategy may be needed to manage a participant’s distributions. Since retirees may have limited ability to recover from a decline in the value of their investments due to a market sell-off, in retirement, we believe it is advisable to take less risk during distribution years versus while working during accumulation years. Our retirement guidance is a 37% allocation to equities.

The retirement allocation is based on the following assumptions:

- The participant retires at age 65.
- The planning horizon is based on participant’s life expectancy +5 years.
- The spending rate can be sustained with 90% confidence.
- The client spends the systematic withdrawal rate as a percentage of wealth in the first year.
- This spending grows with inflation.
- Does not take into account fees, taxes or assumed excess returns from active management decisions.

The retirement guidance provided in Tables 5 and 6 assumes that the client sets an initial spending level, which then grows with inflation. Retirees allocate their account to a fixed mix of investments, from which they periodically draw down funds and then rebalance. When well executed, the approach can allow clients to meet their spending needs while sustaining their wealth throughout retirement.

Many in the industry advocate the “4% rule,” which states that clients can realistically afford to spend 4% of their wealth each year. We find this rule overly simplistic. We believe we offer more nuanced guidance regarding the rate at which a retiree can sustainably spend, critically dependent on a client’s age and risk tolerance. Thus, we believe there is no one-size-fits-all guidance for spending rates.

The systematic withdrawal rates and retirement allocations below are derived based on measuring the likelihood that a retiree will be able to spend according to plan without exhausting her wealth. For example, a 65-year-old and with \$1 million she can draw down 4.22%, or \$42,200, next year and amounts that increase in line with inflation in subsequent years with a 90% confidence level.

**Table 5:** Systematic Withdrawal Rates

		Systematic Withdrawal Rates <sup>1</sup>		
Probability of Success		95%	90%	75%
Level of confidence		High	Moderate	Low
Age	55	3.22%	3.53%	4.33%
	60	3.51%	3.82%	4.60%
	65	3.89%	4.22%	4.98%
	70	4.42%	4.76%	5.51%
	75	5.22%	5.55%	6.30%
	80	6.11%	6.42%	7.18%
	85	7.43%	7.71%	8.49%

<sup>1</sup> Note: The systematic withdrawal rate is the maximum initial share of wealth that we believe a client can spend while attaining a desired “probability of success.” The probability of success measures the likelihood that a retiree will be able to spend according to plan without exhausting wealth. Spending is assumed to rise each year with inflation.

Source: Chief Investment Office.

**Table 6:** Equity Allocations

		Equity Allocations <sup>1</sup>		
Probability of Success		95%	90%	75%
Level of confidence		High	Moderate	Low
Age	55	37%	37%	98%
	60	37%	37%	72%
	65	37%	37%	72%
	70	37%	37%	72%
	75	20%	37%	55%
	80	20%	37%	55%
	85	20%	20%	55%

<sup>1</sup> Note: The equity allocation is the allocation that we believe supports the systematic withdrawal rate.

Source: Chief Investment Office.

---

## 5. REFERENCES

- Benartzi, S., and Thaler, R.T. (2001) "Naive Diversification Strategies in Defined Contribution Saving Plans." *American Economic Review*, vol. 91, no. 1
- Bodie, Z. and Treussard, J. (2007) "Making Investment Choices as Simple as Possible but no Simpler." *Financial Analysts Journal* vol 63 No 3.
- Brunel, J. (2003). "Revisiting the Asset Allocation Challenge through a Behavioral Finance Lens." *The Journal of Wealth Management*.
- Brunel, J (2006) "A Behavioral Finance Approach to Strategic Asset Allocation-A Case Study." *Journal of Investing Consulting*, Vol. 7, No. 3 (2006), pp. 61-69.
- Markovitz, H. (1952). "Portfolio Selection." *Journal of Finance*, 7, 77-91
- Merton, R. (1971) "Optimum Consumption and Portfolio Rules in a Continuous-Time Model." *Journal of Economic Theory*, vol. 3, no. 4 (December) pp. 373-413.
- Merton, R. (1969) "Lifetime Portfolio Selection under Uncertainty: The Continuous- Time Case." *Review of Economics and Statistics* vol 51 no 3 (August) pp. 247-257.
- Marathe, R. R., & Ryan, S. M. (2005). "On the Validity of the Geometric Brownian Motion Assumption." *The Engineering Economist*, 159-192.
- Nevin, D. (2004). "Goals-Based Investing: Integrating Traditional and Behavioral Finance." *The Journal of Wealth Management*, 6(6)
- Sharpe, W. F. (2007). "Lockbox Separation." Working Paper
- Suri, A. and Vrdoljak, N (2018) "Pitfalls in Retirement," Merrill Lynch Wealth Management.
- Suri, A, Vrdoljak, N, Liu, Y and Zhang, R (2019) "Beyond the 4% percent: Determining Sustainable Retiree Spending Rates." Merrill Lynch Wealth Management
- Thaler, R.H. "Toward a Positive Theory of Consumer Choice." *Journal of Economic Behavior and Organization*, Vol. 1 (1980), pp. 39-60.
- Wang, H., Suri, A., Laster, D., & Almadi, H. (2011). "Portfolio Selection in Goals-Based Wealth Management." *The Journal of Wealth Management*, 55-65.

## APPENDIX I : PREVIOUS YEAR'S TARGET DATE ASSET ALLOCATIONS

Note: For current models tables refer to page 3 and 4.

**Table 7:** Target Date Asset Allocations from One Year Ago (2018) (Set I)

Asset Class	Target Date Asset Allocations (Set I)									
	Retirement	2020	2025	2030	2035	2040	2045	2050	2055	2060
U.S. Large Cap Growth	8%	13%	14%	16%	17%	19%	20%	20%	20%	20%
U.S. Large Cap Value	13%	20%	23%	25%	27%	30%	32%	32%	32%	32%
U.S. Small Cap Growth	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%
U.S. Small Cap Value	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%
International Developed Equity	9%	14%	17%	17%	20%	21%	22%	22%	22%	22%
Emerging Markets	3%	6%	6%	7%	8%	9%	9%	9%	9%	9%
Fixed Income	61%	41%	34%	27%	20%	13%	9%	9%	9%	9%
Cash	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Percent Equity	37%	57%	64%	71%	78%	85%	89%	89%	89%	89%
Percent Fixed Income	63%	43%	36%	29%	22%	15%	11%	11%	11%	11%
Expected Arith. Avg. Return (Annl.) <sup>1</sup>	5.9%	6.8%	7.2%	7.5%	7.9%	8.2%	8.5%	8.5%	8.5%	8.5%
Expected Geo. Avg. Return (Annl.) <sup>1</sup>	5.6%	6.4%	6.6%	6.8%	7.0%	7.2%	7.4%	7.4%	7.4%	7.4%
Expected Volatility (Annl.) <sup>*</sup>	7.4%	10.1%	11.4%	12.3%	13.6%	14.7%	15.6%	15.6%	15.6%	15.6%

Please note that the Chief Investment Office may modify the intended percentage allocations.

<sup>1</sup> Note: The expected return and risk is based on CIO Capital Market Assumptions, 2018.

Source: Chief Investment Office Allocations as of January, 2018.

**Table 8:** Target Date Asset Allocations from One Year Ago (2018) (Set II)

Asset Class	Target Date Asset Allocations (Set II)									
	Retirement	2020	2025	2030	2035	2040	2045	2050	2055	2060
U.S. Large Cap Growth	8%	13%	14%	16%	17%	19%	20%	20%	20%	20%
U.S. Large Cap Value	13%	20%	23%	25%	27%	30%	32%	32%	32%	32%
U.S. Small Cap Growth	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%
U.S. Small Cap Value	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%
International Developed Equity	9%	14%	17%	17%	20%	21%	22%	22%	22%	22%
Emerging Markets	3%	6%	6%	7%	8%	9%	9%	9%	9%	9%
U.S. Government	17%	13%	10%	8%	6%	4%	3%	3%	3%	3%
U.S. Mortgages	16%	10%	8%	7%	5%	3%	2%	2%	2%	2%
U.S. Corporates	16%	13%	11%	9%	6%	4%	3%	3%	3%	3%
U.S. High Yield	4%	3%	3%	2%	2%	1%	1%	1%	1%	1%
International Fixed Income	8%	2%	2%	1%	1%	1%	0%	0%	0%	0%
Cash	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Percent Equity	37%	57%	64%	71%	78%	85%	89%	89%	89%	89%
Percent Fixed Income	63%	43%	36%	29%	22%	15%	11%	11%	11%	11%
Expected Arith. Avg. Return (Annl.) <sup>*</sup>	6.1%	7.0%	7.4%	7.6%	8.0%	8.3%	8.5%	8.5%	8.5%	8.5%
Expected Geo. Avg. Return (Annl.) <sup>*</sup>	5.8%	6.5%	6.8%	6.9%	7.1%	7.3%	7.4%	7.4%	7.4%	7.4%
Expected Volatility (Annl.) <sup>*</sup>	7.3%	10.3%	11.5%	12.4%	13.7%	14.8%	15.6%	15.6%	15.6%	15.6%

Please note that the Chief Investment Office may modify the intended percentage allocations.

<sup>1</sup> Note: The expected return and risk is based on CIO Capital Market Assumptions, 2018.

Source: Chief Investment Office Allocations as of January, 2018.

Tables 7 & 8 are intended for illustrative purposes only and are not intended to be representative of the past or future performance of any particular investment. Actual rates of return cannot be predicted and will fluctuate. Asset allocation cannot eliminate the risk of fluctuating prices and uncertain returns. Please note that asset classes are represented by indexes.

Note: The arithmetic mean, a simple average, provides an unbiased estimate of an uncertain variable such as future returns. If, however, when we seek to estimate future compound returns, the more appropriate measure is the geometric mean return. This is the return that, when compounded over the period of time in question, produces the actual realized cumulative return. The arithmetic return of a variable will always be greater than or equal to its geometric return. The greater the volatility, the wider the gap between the arithmetic and geometric returns. Volatility, which reflects future return expectations, is measured as the standard deviation of annual returns. Standard deviation is a common statistical measure that conveys the deviation of a variable (such as asset returns) around its mean.

Please refer to the end of the paper for Asset Class Disclosures and Index Definitions.

Asset class	Index	Description
Cash	ICE BofAML U.S. Treasury Bill 3 months	For the U.S. Treasury Bill index, data from The Wall Street Journal are used for 1977-Present; the CRSP U.S. Government Bond File is the source from 1926 to 1976. Each month a one-bill portfolio containing the shortest-term bill having not less than one month to maturity is constructed. (The bill's original term to maturity is not relevant.)
U.S. Large Cap Growth	Russell 1000 Growth TR	Russell 1000 Growth Total Return measures the performance of the large-cap growth segment of the U.S. equity universe. It includes those Russell 1000 companies with higher price-to-book ratios and higher forecasted growth values.
U.S. Large Cap Value	Russell 1000 Value TR	Russell 1000 Value Total Return measures the performance of the large-cap value segment of the U.S. equity universe. It includes those Russell 1000 companies with lower price-to-book ratios and lower expected growth values.
US Small Cap Growth	Russell 2000 Growth Total Return	Russell 2000 Growth Total Return measures the performance of the broad growth segment of the U.S. equity universe. It includes those Russell 2000 companies with higher price-to-book ratios and higher forecasted growth values.
US Small Cap Value	Russell 2000 Value Total Return	Russell 2000 Value Total Return measures the performance of the large-cap value segment of the U.S. equity universe. It includes those Russell 2000 companies with lower price-to-book ratios and lower expected growth values.
International Developed Equity	MSCI Daily TR Net World Ex USA USD	The MSCI World ex USA Index captures large and mid cap representation across 22 of 23 Developed Markets (DM) countries -- excluding the United States. The index covers approximately 85% of the free float-adjusted market capitalization in each country.
Emerging Markets	MSCI Daily TR Net EM USD	The MSCI Emerging Markets (EM) Index captures large and mid cap representation across 23 Emerging Markets countries and targets coverage of approximately 85% of the free float-adjusted market capitalization in each country.
U.S. Government	ICE BAML AAA U.S. Treasury/Agency Master	The ICE BofA Merrill Lynch US Treasury & Agency Index tracks the performance of US dollar denominated US Treasury and non-subordinated US agency debt issued in the US domestic market. Qualifying securities must have an investment grade rating (based on an average of Moody's, S&P and Fitch). In addition, qualifying securities must have at least one year remaining term to final maturity, at least 18 months to maturity at time of issuance, a fixed coupon schedule and a minimum amount outstanding of \$1 billion for sovereigns and \$250 million for agencies.
U.S. Mortgages	ICE BAML Mortgage Master	The ICE BofA Merrill Lynch US Mortgage Backed Securities Index tracks the performance of U.S. dollar denominated fixed rate and hybrid residential mortgage pass-through securities publicly issued by U.S. agencies in the U.S. domestic market. 30-year, 20-year, 15-year and interest-only fixed rate mortgage pools are included in the Index provided they have at least one year remaining term to final maturity and a minimum amount outstanding of at least \$5 billion per generic coupon and \$250 million per production year within each generic coupon.
U.S. Corporates	ICE BAML U.S. Corp Master	The ICE BofA Merrill Lynch US Corporate Index tracks the performance of U.S. dollar denominated investment grade corporate debt publicly issued in the U.S. domestic market. Qualifying securities must have an investment grade rating (based on an average of Moody's, S&P and Fitch), at least 18 months to final maturity at the time of issuance, at least one year remaining term to final maturity as of the rebalancing date, a fixed coupon schedule and a minimum amount outstanding of \$250 million.
USD High Yield	ICE BAML High Yield Cash Pay	The ICE BofA Merrill Lynch US Cash Pay High Yield Index tracks the performance of U.S. dollar denominated below investment grade corporate debt, currently in a coupon paying period, that is publicly issued in the US domestic market.
International Fixed Income	ICE BAML Global Broad Market TR ex USD (Hedged)	The ICE BofA Merrill Lynch Global Broad Market Excluding US Dollar Index tracks the performance of investment grade debt publicly issued in the major domestic and eurobond markets, including sovereign, quasi-government, corporate, securitized and collateralized securities, excluding all securities denominated in U.S. dollars.

## ASSET CLASS DISCLOSURES

**Equities:** Investments in equities are subject to the risks of fluctuating stock prices, which can generate investment losses. Equities have historically been more volatile than alternatives such as fixed income securities. International investments are subject to additional risks such as currency fluctuation, political instability and the potential for illiquid markets. Emerging markets bear similar but accentuated risks.

**Small/Mid Cap:** Stocks of small cap and mid cap companies pose special risks, including possible illiquidity and greater price volatility than stocks of larger, more established companies.

**International:** International investing involves special risks, including foreign taxation, currency risks, risks associated with possible differences in financial standards and other risks associated with future political and economic developments.

**Emerging Markets:** Investing in emerging markets may involve greater risks than investing in more developed countries. In addition, concentration of investments in a single region may result in greater volatility.

**Fixed Income:** Fixed income investments fluctuate in value in response to changes in interest rates. Mortgage-backed securities are subject to credit risk and the risk that the mortgages will be prepaid, so that portfolio management may be faced with replenishing the portfolio in a possibly disadvantageous interest rate environment.

**High Yield:** Investments in high-yield bonds (sometimes referred to as "junk bonds") offer the potential for high current income and attractive total return, but involve certain risks. Changes in economic conditions or other circumstances may adversely affect a junk bond issuer's ability to make principal and interest payments.

---

**Anil Suri** is a Managing Director and Portfolio Analytics & Investment Analytics Executive within the Global Portfolio Solutions Group for the Global Wealth & Investment Management (GWIM), a division of the Bank of America Corporation, Chief Investment Office (CIO). In this role, he leads the development of frameworks and solutions for asset allocation, portfolio construction, goals-based wealth management and retirement investing and is the lead portfolio manager on the Dynamic Asset Allocation Strategy. Previously, he managed the Portfolio Construction & Management and launched the Dynamic Asset Allocation Exchange Traded Funds (ETF) portfolios, led investment strategy for Alternative Investments (AI), managed Fund of Hedge Fund portfolios, and was a Senior Investment Strategist on the Merrill Lynch Research Investment Committee (RIC). Prior to joining Merrill Lynch, he was a senior AI strategist at Citigroup, high yield and distressed debt trader at Credit Suisse and management consultant at McKinsey. Anil's research has been discussed in Barron's and The Wall Street Journal and published in several peer-reviewed publications such as the Journal of Portfolio Management. Anil earned his M.B.A. with honors from the Wharton School of the University of Pennsylvania, an M.S.E. from Princeton University and a B. Tech. from the Indian Institute of Technology at Delhi. He also serves on the International Advisory Board of the EDHEC (Ecole des Hautes Etudes Commerciales du Nord) Risk Institute in Nice, France.

**Yong Liu** is a Director and Senior Quantitative Analyst within the Global Portfolio Solutions Group for Global Wealth & Investment Management (GWIM) a division of Bank of America Corporation, Chief Investment Office (CIO). In this role, he is responsible for developing asset allocation and portfolio construction solutions for wealth and investment management. Yong has been with Bank of America since 2014, where he started in model risk function for Global Wealth and Investment Management. Prior to joining Bank of America, Yong's experience includes quantitative investment and trading in emerging markets equity, and systematic global macro portfolio management at two hedge funds, TRG Management and ISAM. Yong also had experience as a senior algorithm designer at SAP America. Yong holds a Ph.D. degree in Operations Research from Boston University, an M.S. in Computational Finance from Carnegie Mellon University, and a B.E. in Information and Systems Engineering from Xi'an Jiaotong University in China.

**Nevenka Vrdoljak** is a Director and Senior Quantitative Analyst within the Global Portfolio Solutions Group for Global Wealth & Investment Management (GWIM) a division of Bank of America Corporation, Chief Investment Office (CIO). In this role, Nevenka is responsible for asset allocation and retirement investing for Merrill Lynch Wealth Management. She had been involved in the development of retirement planning tools, applications and calculators. She published in several peer-reviewed publications such as the Journal of Wealth Management and Journal of Retirement. Prior to joining Bank of America, Nevenka held analytical roles at Goldman Sachs Asset Management (London) and Deutsche Bank Asset Management (Sydney) in the fixed income, currency and derivatives areas. Nevenka earned her Bachelor and Master degrees with honors in Economics from the University of New South Wales (Sydney). She also earned her Master degree in Mathematics of Finance from Columbia University.

**Run Zhang** is an Assistant Vice President within the Chief Investment Office (CIO) for Global Wealth & Investment Management (GWIM), a division of Bank of America Corporation. In this role, he provides quantitative analysis on asset allocation and goal-based investing. Prior to joining Bank of America, Run interned at an investment bank in China, and asset management firms in Seattle and Boston, in areas such as fundamental analysis, portfolio analytics and quantitative trading strategies. Run earned his B.S. and B.A. degree, summa cum laude, in Mathematics and Finance from University of Washington, and his M.S. degree in Computational Finance from Carnegie Mellon University.

## Recent Publications from the Chief Investment Office

Winter	2019	Target Date Asset Allocation	Suri/Vrdoljak/Liu/Zhang
Winter	2019	Determining Sustainable Retiree Spending Rates	Suri/Vrdoljak/Liu/Zhang
Winter	2019	Women & Life-Defining Financial Decisions	Rappaport/Vrdoljak
Spring	2018	Tackling Retirement Risks	Suri/Vrdoljak
Spring	2018	Pitfalls in Retirement	Suri/Vrdoljak
Fall	2018	Claiming Social Security	Suri/Vrdoljak
Summer	2018	A Path to Retirement Success	Suri/Vrdoljak

### IMPORTANT DISCLOSURES

This material was prepared by the Chief Investment Office (CIO) and is not a publication of BofA Merrill Lynch Global Research. The views expressed are those of the CIO only and are subject to change. This information should not be construed as investment advice. It is presented for information purposes only and is not intended to be either a specific offer by any Merrill Lynch or U.S. Trust entity to sell or provide, or a specific invitation for a consumer to apply for, any particular retail financial product or service that may be available.

Global Wealth & Investment Management (GWIM) is a division of Bank of America Corporation. Merrill Lynch Wealth Management, Merrill Edge®, U.S. Trust, and Bank of America Merrill Lynch are affiliated sub-divisions within GWIM. The Chief Investment Office, which provides investment strategies, due diligence, portfolio construction guidance and wealth management solutions for GWIM clients, is part of the Investment Solutions Group (ISG) of GWIM.

The GWIM Investment Strategy Committee (GWIM ISC) is responsible for developing and coordinating recommendations for short-term and long-term investment strategy and market views encompassing markets, economic indicators, asset classes and other market-related projections affecting GWIM.

**Neither Merrill Lynch, U.S. Trust nor any of their affiliates or advisors provide legal, tax or accounting advice. You should consult your legal and/or tax advisors before making any financial decisions.**

**The 'target date' of the model represents the approximate date in which an investor might plan to begin withdrawing money. The principal value of the portfolio model is not guaranteed at any time, including the prescribed targeted date. As the targeted date approaches, the objective and investment strategy of the portfolio model will generally become more conservative.**

The whitepaper is provided for information and educational purposes only. The opinions and views expressed do not necessarily reflect the opinions and views of Bank of America Corporation or any of its affiliates. Any assumptions, opinions and estimates are as of the date of this material and are subject to change without notice. **Past performance does not guarantee future results.** The information contained in this material does not constitute advice on the tax consequences of making any particular investment decision. The material does not take into account a client's particular investment objectives, financial situations or needs and is not intended as a recommendation, offer or solicitation for the purchase or sale of any security, financial instrument, or strategy. Before acting on any recommendation clients should consider whether it is suitable for their particular circumstances and, if necessary, seek professional advice.

This information should not be construed as investment advice. It is presented for information purposes only and is not intended to be either a specific offer by any Merrill Lynch entity to sell or provide, or a specific invitation for a consumer to apply for, any particular retail financial product or service that may be available through the Merrill Lynch family of companies.

To set asset class assumptions, Merrill Lynch's investment professionals, which represent GWIM CIO group and BofA Merrill Lynch Global Research group, follow a rigorous review process and consider a number of factors and analyses, including a close examination of asset class performance over several economic cycles. Special events or circumstances are also considered, but with the appreciation that future performance may not necessarily follow patterns established in the past. As these characteristics do not remain constant, Merrill Lynch reviews and revises them at least annually.

Asset allocation, rebalancing and diversification do not assure a profit or protect against a loss during declining markets. Asset allocation cannot eliminate the risk of fluctuating prices and uncertain returns.

© 2019 Bank of America Corporation. All rights reserved.

ARH5LVH7