

# FEDERAL THRIFT SAVINGS PLAN LIFECYCLE FUND ASSET ALLOCATION

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# TSP Goals for Lifecycle Fund Development

To construct customized lifecycle funds that are:

- composed of the TSP Core Funds
- a series of evolving targeted maturity funds that become more conservative as the set “maturity date”<sup>1</sup> approaches
- able to accommodate daily cash flows and minimize transaction costs
- easily communicated and understood by participants
- a convenient and automatic way for participants to diversify their investment account

<sup>1</sup>The target maturity date is the date the participant expects to begin withdrawing money from his or her account. This date may or may not be the date the participant retires from his or her agency or even the date the participant stops working.

## Plan Characteristics

In arriving at its fund structure recommendations, Mercer considered:

- TSP participant demographic information. We assumed that the participants were members of FERS and based our projections on typical account balances and contribution patterns for the targeted group for each Lifecycle Fund
- Plan-level financial information including the volume and pattern of daily cash movements
- Underlying composition and management of each of the five Core Funds, including the unique aspects of the G Fund:
  - Returns equivalent to long government bond yields
  - No default risk

# Overview

- The purpose of this study is to review the current asset allocations of the lifecycle funds of the Federal Retirement Thrift Savings Plan
- Key objectives and metrics:
  - Provide opportunity to achieve sufficient retirement income for career FERS employees
    - *Metric: Range of account balances and replacement ratios*
  - Provide capital preservation for participants as they approach retirement
    - *Metric: Likelihood of loss in final two years before retirement*
  - Limit likelihood of running out of assets in retirement
    - *Metric: Expected account drawdown age*

## Executive Summary

*A review of the analysis and metrics highlights the following:*

- Adding equity along the glide path improves projected account balances, but adds to capital preservation risk at retirement
- Increasing international equity weight has relatively small positive impact given the current EAFE benchmark for the I Fund
- Current slight overweight position in small cap equity (S Fund) less favorable than prior years; outcomes in line with market weight allocation
- Given the rise in rates built into the assumptions, G Fund continues to outperform F Fund in short term
- Replacement ratios, in combination with Social Security and the defined benefit program, likely to meet the commonly suggested targets (i.e. 70-80% of earnings) for career employees

# FEDERAL RETIREMENT THRIFT SAVINGS PLAN: Mean-Variance and Efficient Frontier Analysis

# Mercer Capital Market Assumptions

- We conducted our analysis using capital market assumptions over a 20-year time horizon:
  - Real economic growth is 2.7%
  - Inflation is 2.5%
  - For equities, the table below breaks down the components for our equity assumptions.

	C Fund	S Fund	I Fund
<b>Inflation</b>	2.5%	2.5%	2.0%
<b>Real Earnings Growth</b>	2.5%	4.3%	1.7%
<b>Dividend/Income</b>	2.7%	1.5%	3.0%
<b>P/E Expansion(Contraction)</b>	-1.1%	-1.4%	0.0%
<b>Currency Drag</b>	0.0%	0.0%	1.1%
<b>Total</b>	6.6%	6.9%	7.8%



## Applying Capital Market Assumptions:

- Using our capital market assumptions and statistical modeling, we calculated expected risk and return for each of the five core funds.

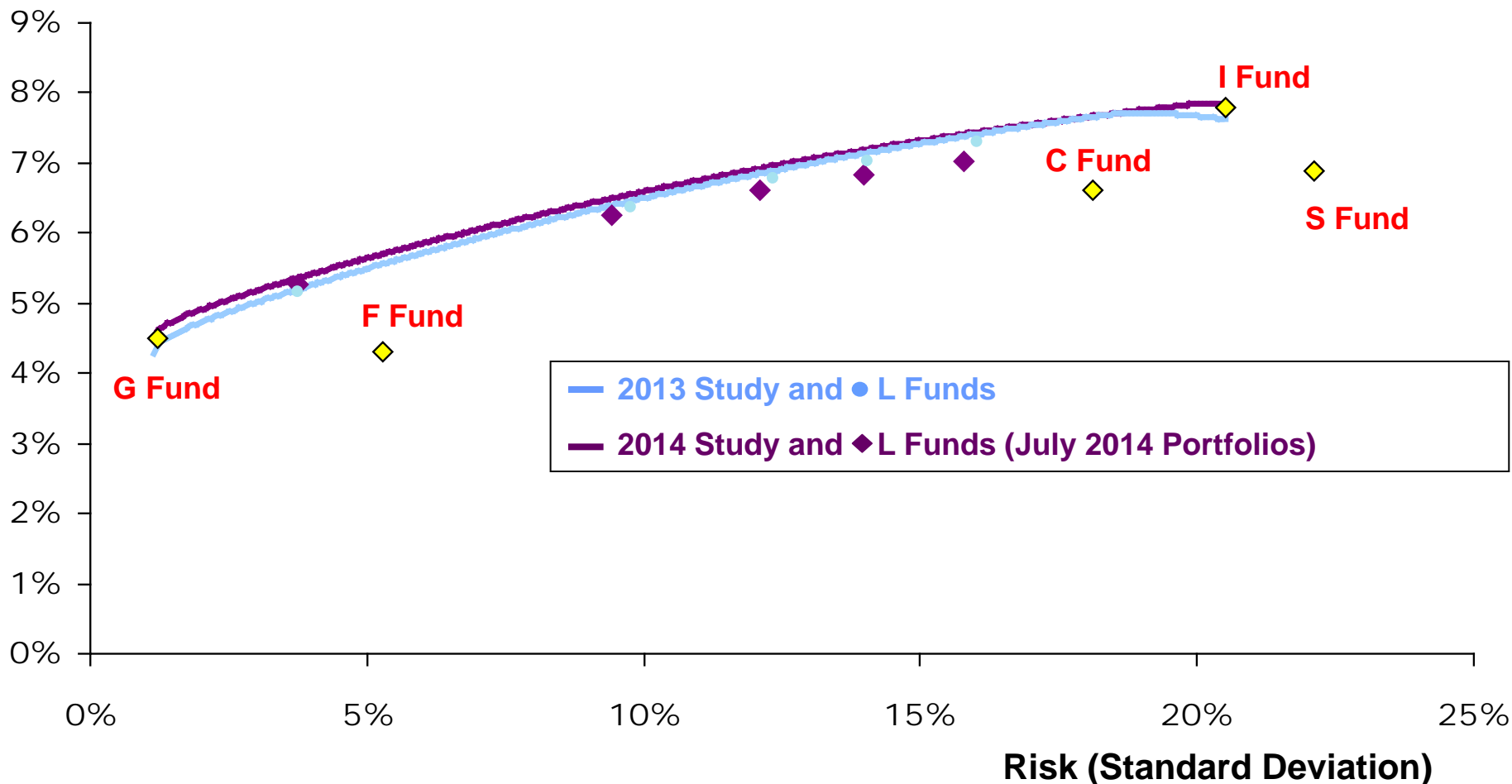
	Geometric Return	Standard Deviation	Interest and Dividend Income
<b>C Fund: Large Cap Equity</b>	6.6%	18.1%	1.91%
<b>S Fund: Small Cap Equity</b>	6.9%	22.1%	1.32%
<b>I Fund: International Equity</b>	7.8%	20.5%	3.00%
<b>F Fund: Broad Market Fixed Inc</b>	4.3%	5.3%	2.22%
<b>G Fund: Government Yields</b>	4.5%	1.2%	2.25%

- We also need to set the correlation assumptions – very important in determining the diversification benefits. Correlation tells how much the markets move together (high correlation), whether they are independent (low correlation), or even inversely related (negative correlation).

	C Fund	S Fund	I Fund	F Fund	G Fund
<b>C Fund</b>	1.00				
<b>S Fund</b>	0.91	1.00			
<b>I Fund</b>	0.77	0.72	1.00		
<b>F Fund</b>	0.11	0.10	0.03	1.00	
<b>G Fund</b>	0.00	0.00	0.00	-0.10	1.00

# Position of Lifecycle Funds on the Efficient Frontier: Including 2013 and 2014

## Expected Geometric Return



# STOCHASTIC MODELING

The background of the slide is composed of three distinct horizontal bands of color. The top band is a dark navy blue, the middle band is a medium teal, and the bottom band is a bright cyan. The boundary between the top and middle bands is a diagonal line that slopes upwards from left to right.

# Stochastic Modeling

- We projected inflation, economic growth, salary growth, corporate profits, P/E ratios, interest rates and exchange rates and used these results to compute capital market returns.
- We also had special states of the world to accommodate these regimes:
  - Normal Growth: Above average growth with modest inflation
  - Recession: Negative economic growth, low inflation
  - Stagflation: Low economic growth, high inflation (6%)
  - Inflationary Growth: Above average growth with high inflation
  - Ideal Growth: Very high growth with very low inflation
  - Credit crunch: Severely negative growth, deflation
  - High Inflation: Inflation moves to 10%, growth slumps

## Model Outcomes

- Incorporate demographic assumptions
- Project investment outcomes by using stochastic analysis (1,000 simulations) of:
  - Economic factors
    - Inflation, growth, interest rates, salary growth, capital market returns
  - Typical behavior of participants by age group
    - Participants increase contributions over time
    - Participants retire at approximately age 61
  - Change in asset allocation over time as the Lifecycle fund becomes more conservative

## Demographic Inputs Derived From OPM Data Match

Fund	Target Demographic by Age	Age	Salary	Account Balance	Starting Contribution Rate	Salary Growth (OPM Proj.)
2020	50-59	55	\$ 76,000	\$ 150,000	7.25%	4.00%
2030	40-49	45	\$ 75,000	\$ 110,000	6.00%	4.00%
2040	30-39	35	\$ 68,000	\$ 50,000	5.25%	4.00%
2050	<30	25	\$ 54,000	\$ 20,000	4.50%	4.00%

- Three year federal wage freeze through 2013. Salary growth rate of 4% is based on OPM long term assumption of 1.5% real wage growth and assumed inflation rate of 2.5%.
- Average salary and account balances are based on data from 2012 rolled forward
- Estimated contribution rate based on age-range averages across all FERS employees in 2013

# Glide Paths Considered: 2014 Study

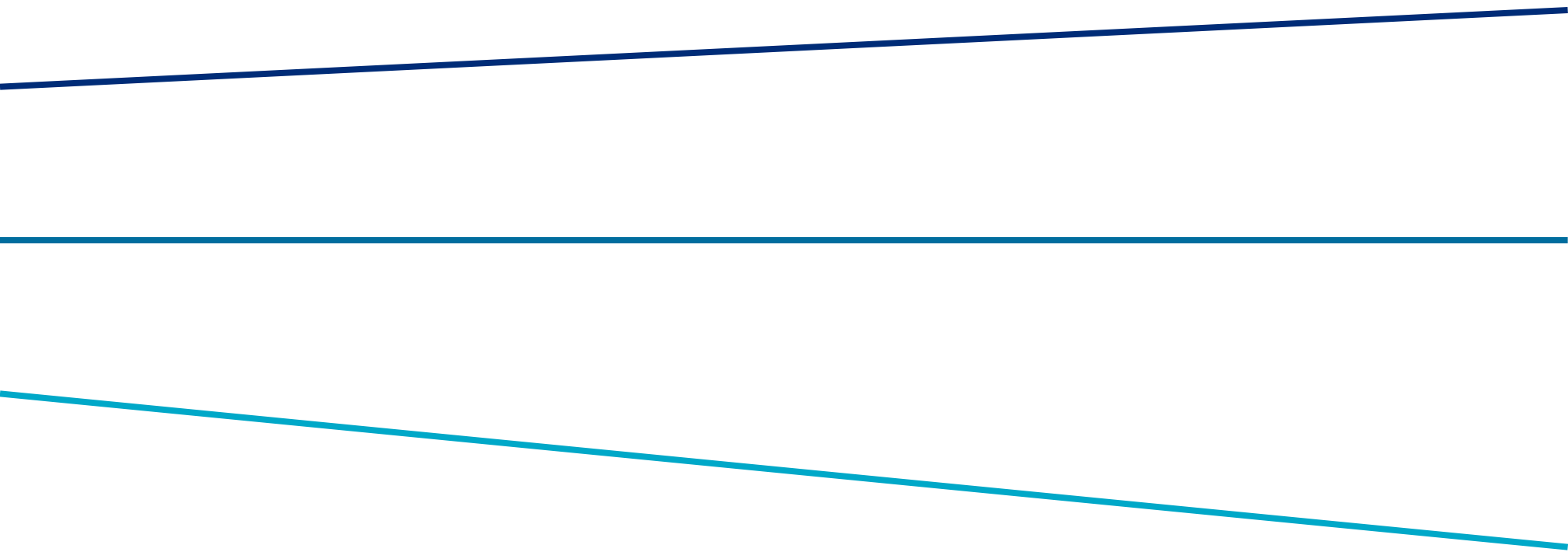
Current glide path (allocations as of July 2014)

	2050	2040	2030	2020	Income
Allocations	Portfolio	Portfolio	Portfolio	Portfolio	Portfolio
C-Fund	42.4	38.4	34.4	27.7	12.0
S-Fund	18.2	16.2	12.4	8.4	3.0
I-Fund	25.4	21.4	19.2	15.4	5.0
F-Fund	3.45	5.23	5.40	5.07	6.00
G-Fund	10.55	18.77	28.60	43.43	74.00
Total	100.0	100.0	100.0	100.0	100.0
<b>Asset Class Ratios</b>					
Pct Equity	86.0	76.0	66.0	51.5	20.0
Int Eq/Tot Eq	29.5	28.2	29.1	29.9	25.0
S-Fund/Domestic Eq	30.0	29.7	26.5	23.3	20.0
F-Fund/Total FI	24.6	21.8	15.9	10.5	7.5

Alternative glide paths reviewed in three groups

Summary of Alternative Glide Paths		
Group 1: Test Equity Allocation	Group 2: Test Equity Structure	Group 3: Test Fixed Income
Equity Decreased by 5%	International Equity Increased to 35% of Total	100% F Fund for Fixed Income
Equity Increased by 5%	International Equity Increased to 40% of Total	100% G Fund for Fixed Income
Equity Increased by 10%	Small Cap Equity Reduced to 20% of Domestic Equity	
More Equity in 2040, 2030, and 2020 Funds (5-10%)		

# Modeling Results Example: 2030 Fund





# 2030 Fund Results

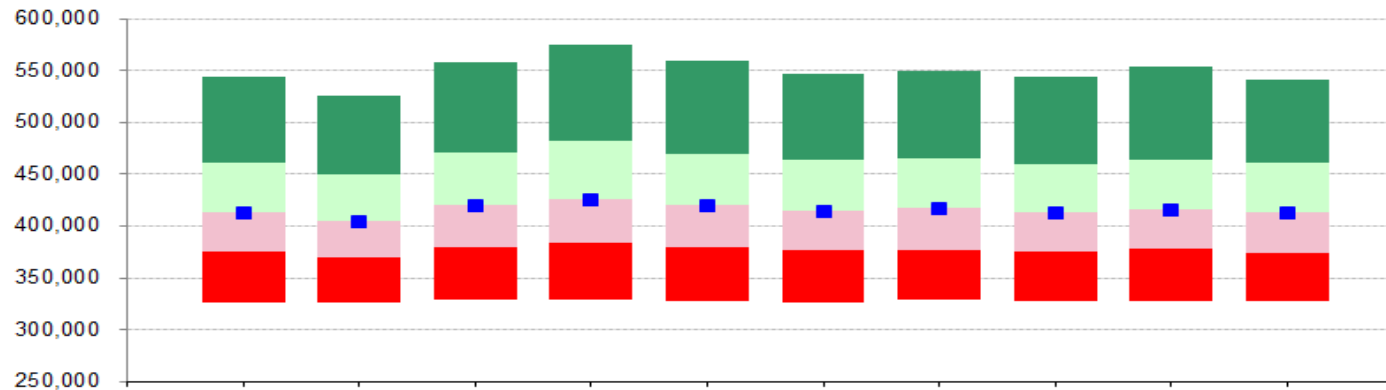
For purposes of this illustration, we selected a representative career FERS participant with entry age 37 and retirement at age 61. Results for a 2030 Lifecycle Fund investor -- 45 yr. old FERS employee with approximately 8 years of tenure, a \$110,000 account balance, and currently earning \$75,000/yr. Assumed real wage growth is 1.5%/yr. and inflation is 2.5%.

	<u>Current Glide Path</u>	<u>More Equity 2040 - 2020</u>	<u>Increase International Equity to 40%</u>
Median Account Balance at 2030 (real \$)	\$412,650	\$419,465	\$416,531
5th Pct Account Balance at 2030 (real \$)	\$326,263	\$327,227	\$328,409
TSP Median Replacement Ratio at 2030	26%	26%	26%
TSP 5 <sup>th</sup> Pct Replacement Ratio at 2030	19%	19%	19%
Total FERS Median Replacement Ratio* at 2030	72%	72%	72%
Total FERS 5 <sup>th</sup> Pct Replacement Ratio* at 2030	64%	64%	64%
Probability of Decline over Final 2 Yrs.	7.70%	8.50%	8.20%
Assume post-retirement spending is 80% of final inflation adjusted salary.			
Probability account depleted - age 80	63.20%	62.60%	62.70%
Probability account depleted - age 90	94.40%	94.60%	94.10%

\* includes estimated replacement from Social Security (22% to 23%) and FERS defined benefit (24%)

# Summary of Real (Inflation-Adjusted) Account Balances at Maturity: 2030 Fund

## Range of Real Account Balances



Assumptions:  
Age: **45**  
Salary: **75,000**  
Account Balance:  
**110,000**  
Deferral Rate:  
**6.00%**

(\$thousands)

		Current	Equity reduced by 5%	Equity increased by 5%	Equity increased by 10%	More Equity 2040 through 2020 funds (5% to 10%)	International Equity increased to 35% of total	International Equity increased to 40% of total	Small Cap Equity 20% of Domestic Equity	100% F Fund for Fixed Income	100% G Fund for Fixed Income
95th		544	526	558	574	559	547	549	544	553	541
75th		461	449	471	482	470	463	466	460	464	461
50th		413	404	420	425	419	414	417	412	415	412
25th		375	370	380	384	379	376	377	375	377	374
5th		326	325	328	328	327	327	328	327	327	327

- Higher equity allocations provide improvement in account balances across range of outcomes

# Summary of Replacement Ratios at Maturity: 2030 Fund

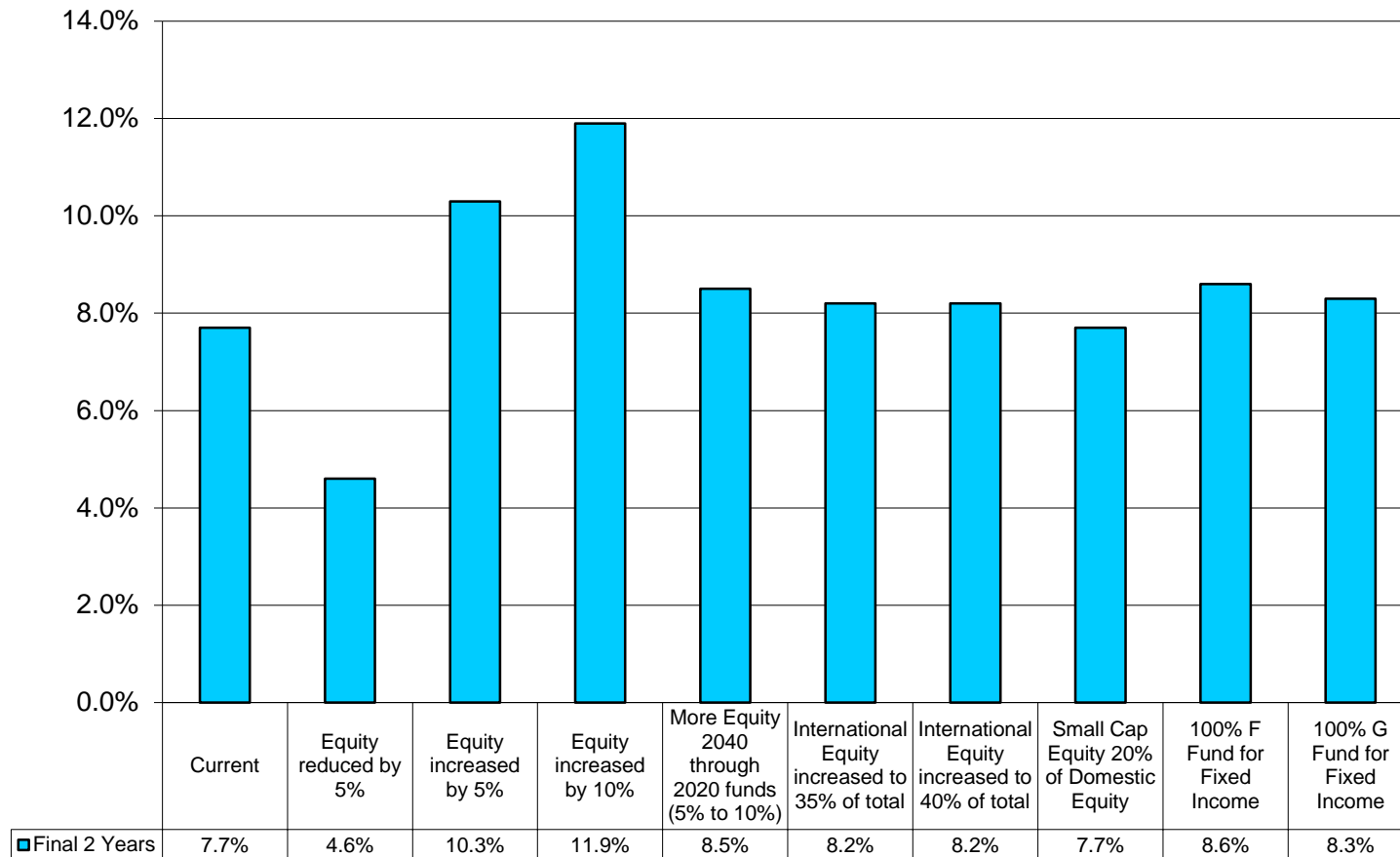
Range of Replacement Ratios



		Current	Equity reduced by 5%	Equity increased by 5%	Equity increased by 10%	More Equity 2040 through 2020 funds (5% to 10%)	International Equity increased to 35% of total	International Equity increased to 40% of total	Small Cap Equity 20% of Domestic Equity	100% F Fund for Fixed Income	100% G Fund for Fixed Income
95th		85%	84%	86%	87%	86%	85%	85%	85%	84%	85%
75th		76%	75%	77%	77%	77%	76%	76%	76%	76%	76%
50th		72%	71%	72%	72%	72%	72%	72%	72%	72%	72%
25th		68%	68%	68%	68%	68%	68%	68%	68%	68%	68%
5th		64%	64%	64%	64%	64%	64%	64%	64%	64%	64%

- Replacement ratio measures the percentage of final salary than can be replaced in retirement assuming an average life expectancy (based on annuity pricing)
- Overall, replacement ratio outcomes are similar across the range of alternatives
- Additional equity tends to increase expected replacement ratios for optimistic scenarios

# Probability of Decline in Account Balance In Final Two Years Before Maturity, In Real (Inflation-Adjusted) Terms: 2030 Fund



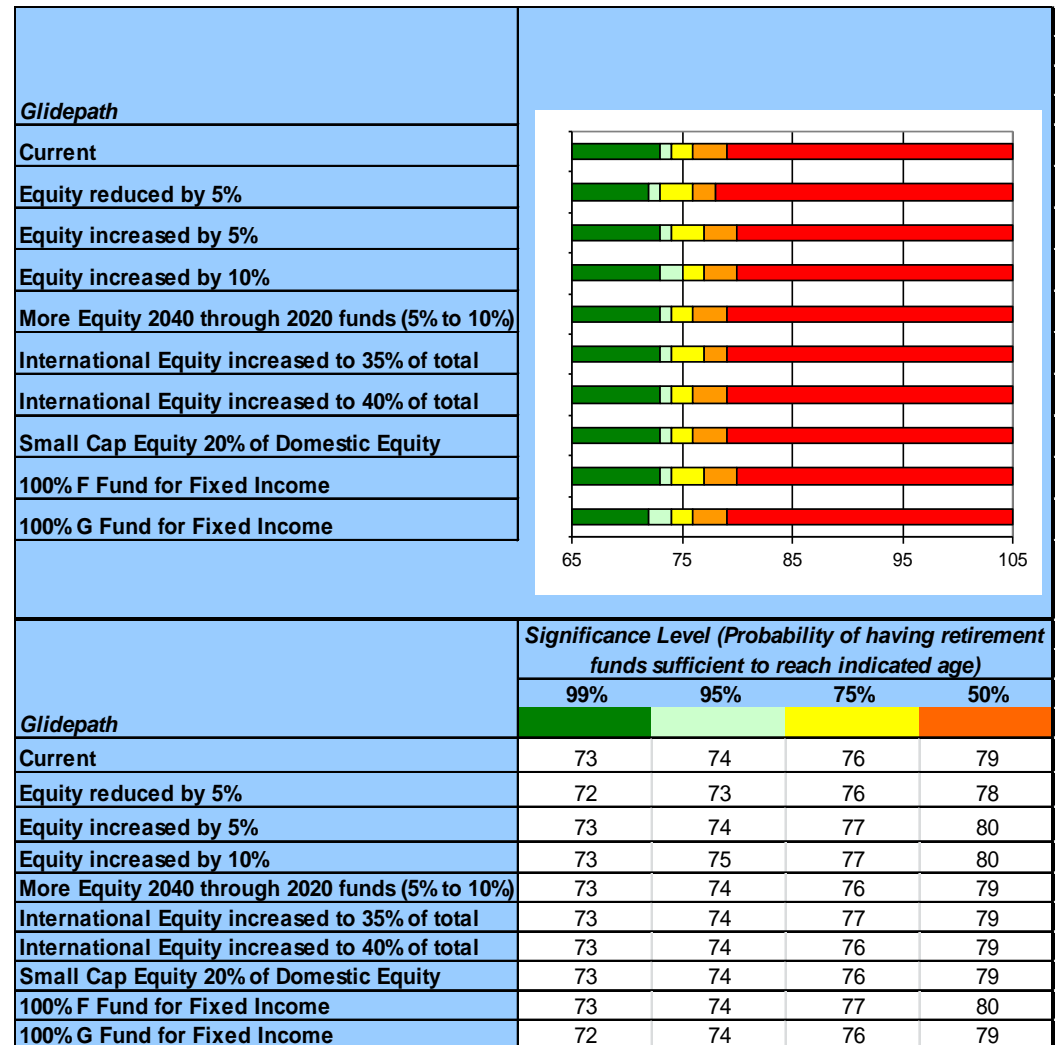
**Probability of Loss in Final Two Years (Real)**

- This measure is influenced by the size of account balance as well as the size of the contributions
- Lower equity glide paths reduce the probability of a decline in account balances, while the higher equity glide paths increase the probability of decline

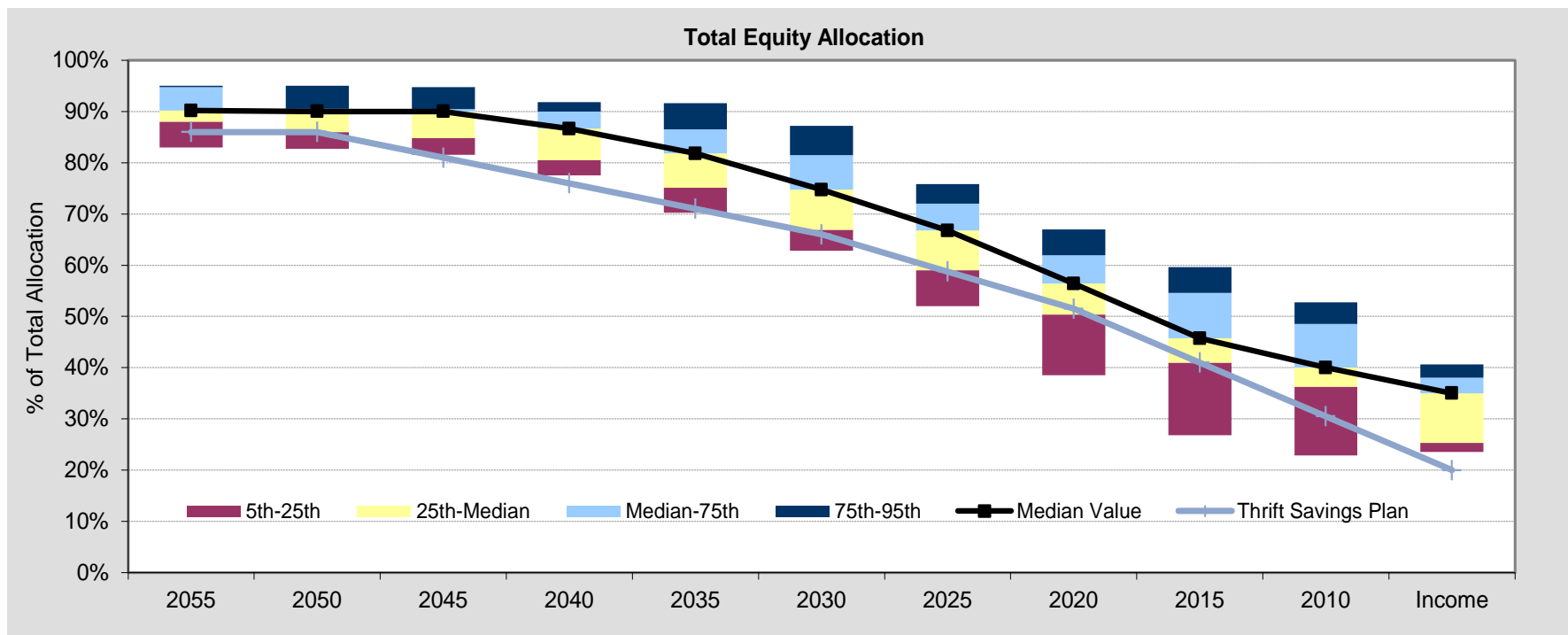
# Expected Account Depletion Ages: 2030 Fund

- Assumes retirement spending budget of 80% of final pay at retirement
- Under median outcome, account expected to last 18 years post-retirement
- 1% chance of depleting DC assets within 12 years post-retirement with current glide path
- Outcomes improve slightly with higher equity allocation and with 100% F Fund for fixed income

## Projected Age DC Fund Drawdown Reaches Zero

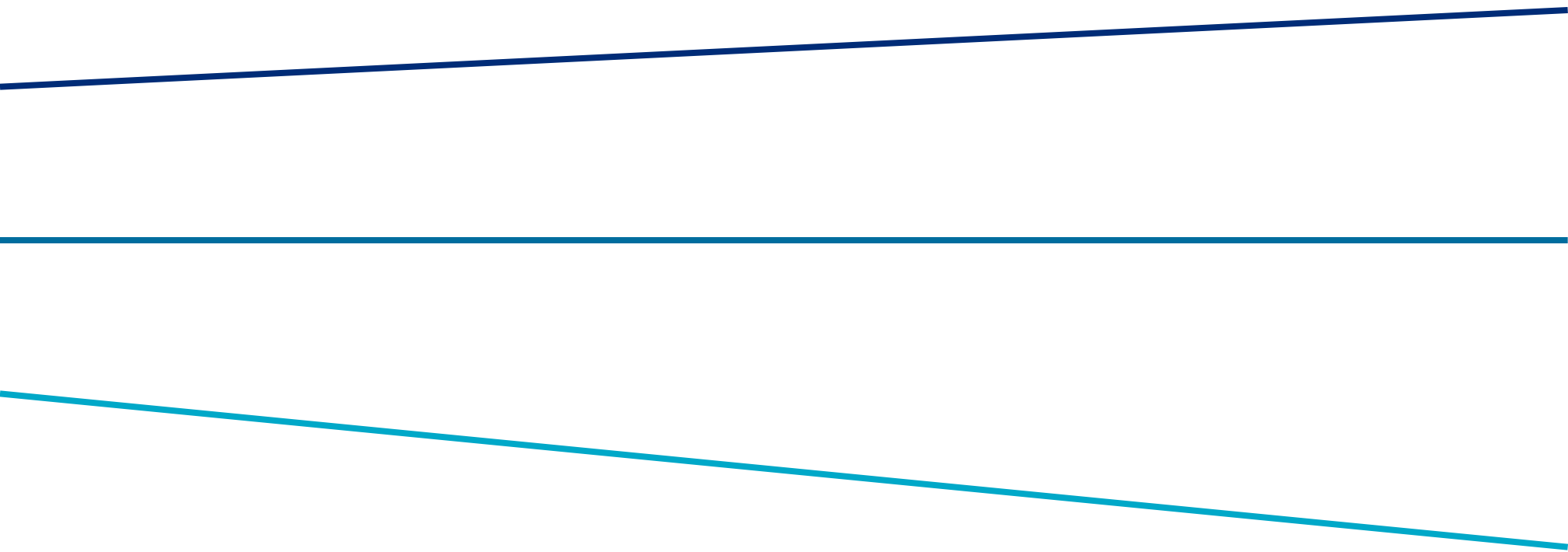


# Equity Allocation: Comparison to Mercer Survey



- Some TDF providers have increased the equity allocation in their glidepath over the last year.

# Recommendations



## Recommendations

- Retirement outcomes are similar across glide path alternatives studied
- Relatively conservative approach provides participants with good opportunity to meet retirement objectives
- No compelling need for change to existing allocations





# Appendix

## Alternative Glide Paths Market Survey



# Current Asset Allocation of Alternative Glide Paths

## Decrease Equity 5%

	2050	2040	2030	2020	Income
Allocations	Portfolio	Portfolio	Portfolio	Portfolio	Portfolio
C-Fund	39.9	35.9	31.8	25.0	9.0
S-Fund	17.1	15.1	11.5	7.6	2.3
I-Fund	23.9	20.0	17.7	13.9	3.8
F-Fund	4.7	6.3	6.2	5.6	6.4
G-Fund	14.3	22.7	32.8	47.9	78.6
Total	100.0	100.0	100.0	100.0	100.0
<b>Asset Class Ratios</b>					
Pct Equity	81.0	71.0	61.0	46.5	15.0
Int Eq/Tot Eq	29.5	28.2	29.1	29.9	25.0
S-Fund/Domestic Eq	30.0	29.7	26.5	23.3	20.0
F-Fund/Total FI	24.6	21.8	15.9	10.5	7.5

## Increase Equity 5%

	2050	2040	2030	2020	Income
Allocations	Portfolio	Portfolio	Portfolio	Portfolio	Portfolio
C-Fund	44.9	40.9	37.0	30.4	15.0
S-Fund	19.3	17.3	13.3	9.2	3.8
I-Fund	26.9	22.8	20.7	16.9	6.3
F-Fund	2.2	4.1	4.6	4.5	5.6
G-Fund	6.8	14.9	24.4	39.0	69.4
Total	100.0	100.0	100.0	100.0	100.0
<b>Asset Class Ratios</b>					
Pct Equity	91.0	81.0	71.0	56.5	25.0
Int Eq/Tot Eq	29.5	28.2	29.1	29.9	25.0
S-Fund/Domestic Eq	30.0	29.7	26.5	23.3	20.0
F-Fund/Total FI	24.6	21.8	15.9	10.5	7.5

## Increase Equity 10%

	2050	2040	2030	2020	Income
Allocations	Portfolio	Portfolio	Portfolio	Portfolio	Portfolio
C-Fund	47.3	43.5	39.6	33.1	18.0
S-Fund	20.3	18.3	14.3	10.0	4.5
I-Fund	28.4	24.2	22.1	18.4	7.5
F-Fund	1.0	3.1	3.8	4.0	5.3
G-Fund	3.0	10.9	20.2	34.5	64.8
Total	100.0	100.0	100.0	100.0	100.0
<b>Asset Class Ratios</b>					
Pct Equity	96.0	86.0	76.0	61.5	30.0
Int Eq/Tot Eq	29.5	28.2	29.1	29.9	25.0
S-Fund/Domestic Eq	30.0	29.7	26.5	23.3	20.0
F-Fund/Total FI	24.6	21.8	15.9	10.5	7.5

## More Equity 2040 - 2020

	2050	2040	2030	2020	Income
Allocations	Portfolio	Portfolio	Portfolio	Portfolio	Portfolio
C-Fund	42.4	40.9	39.6	30.4	12.0
S-Fund	18.2	17.3	14.3	9.2	3.0
I-Fund	25.4	22.8	22.1	16.9	5.0
F-Fund	3.5	4.1	3.8	4.5	6.0
G-Fund	10.6	14.9	20.2	39.0	74.0
Total	100.0	100.0	100.0	100.0	100.0
<b>Asset Class Ratios</b>					
Pct Equity	86.0	81.0	76.0	56.5	20.0
Int Eq/Tot Eq	29.5	28.2	29.1	29.9	25.0
S-Fund/Domestic Eq	30.0	29.7	26.5	23.3	20.0
F-Fund/Total FI	24.6	21.8	15.9	10.5	7.5

# Current Asset Allocation of Alternative Glide Paths

## International Equity Increased to 35% of Total Equity

	2050	2040	2030	2020	Income
Allocations	Portfolio	Portfolio	Portfolio	Portfolio	Portfolio
C-Fund	39.1	34.7	31.5	25.7	10.4
S-Fund	16.8	14.7	11.4	7.8	2.6
I-Fund	30.1	26.6	23.1	18.0	7.0
F-Fund	3.5	5.2	5.4	5.1	6.0
G-Fund	10.6	18.8	28.6	43.4	74.0
Total	100.0	100.0	100.0	100.0	100.0
<b>Asset Class Ratios</b>					
Pct Equity	86.0	76.0	66.0	51.5	20.0
Int Eq/Tot Eq	35.0	35.0	35.0	35.0	35.0
S-Fund/Domestic Eq	30.0	29.7	26.5	23.3	20.0
F-Fund/Total FI	24.6	21.8	15.9	10.5	7.5

## International Equity Increased to 40% of Total Equity

	2050	2040	2030	2020	Income
Allocations	Portfolio	Portfolio	Portfolio	Portfolio	Portfolio
C-Fund	36.1	32.1	29.1	23.7	9.6
S-Fund	15.5	13.5	10.5	7.2	2.4
I-Fund	34.4	30.4	26.4	20.6	8.0
F-Fund	3.5	5.2	5.4	5.1	6.0
G-Fund	10.6	18.8	28.6	43.4	74.0
Total	100.0	100.0	100.0	100.0	100.0
<b>Asset Class Ratios</b>					
Pct Equity	86.0	76.0	66.0	51.5	20.0
Int Eq/Tot Eq	40.0	40.0	40.0	40.0	40.0
S-Fund/Domestic Eq	30.0	29.7	26.5	23.3	20.0
F-Fund/Total FI	24.6	21.8	15.9	10.5	7.5

## Small Cap Equity to 20% of Domestic Equity

	2050	2040	2030	2020	Income
Allocations	Portfolio	Portfolio	Portfolio	Portfolio	Portfolio
C-Fund	48.5	43.7	37.4	28.9	12.0
S-Fund	12.1	10.9	9.4	7.2	3.0
I-Fund	25.4	21.4	19.2	15.4	5.0
F-Fund	3.5	5.2	5.4	5.1	6.0
G-Fund	10.6	18.8	28.6	43.4	74.0
Total	100.0	100.0	100.0	100.0	100.0
<b>Asset Class Ratios</b>					
Pct Equity	86.0	76.0	66.0	51.5	20.0
Int Eq/Tot Eq	29.5	28.2	29.1	29.9	25.0
S-Fund/Domestic Eq	20.0	20.0	20.0	20.0	20.0
F-Fund/Total FI	24.6	21.8	15.9	10.5	7.5

# Current Asset Allocation of Alternative Glide Paths

## 100% F Fund for Fixed Income

Assumptions	2050 Portfolio	2040 Portfolio	2030 Portfolio	2020 Portfolio	Income Portfolio
C-Fund	42.4	38.4	34.4	27.7	12.0
S-Fund	18.2	16.2	12.4	8.4	3.0
I-Fund	25.4	21.4	19.2	15.4	5.0
F-Fund	14.0	24.0	34.0	48.5	80.0
G-Fund	0.0	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0
<b>Asset Class Ratios</b>					
Pct Equity	86.0	76.0	66.0	51.5	20.0
Int Eq/Tot Eq	29.5	28.2	29.1	29.9	25.0
S-Fund/Domestic Eq	30.0	29.7	26.5	23.3	20.0
F-Fund/Total FI	100.0	100.0	100.0	100.0	100.0

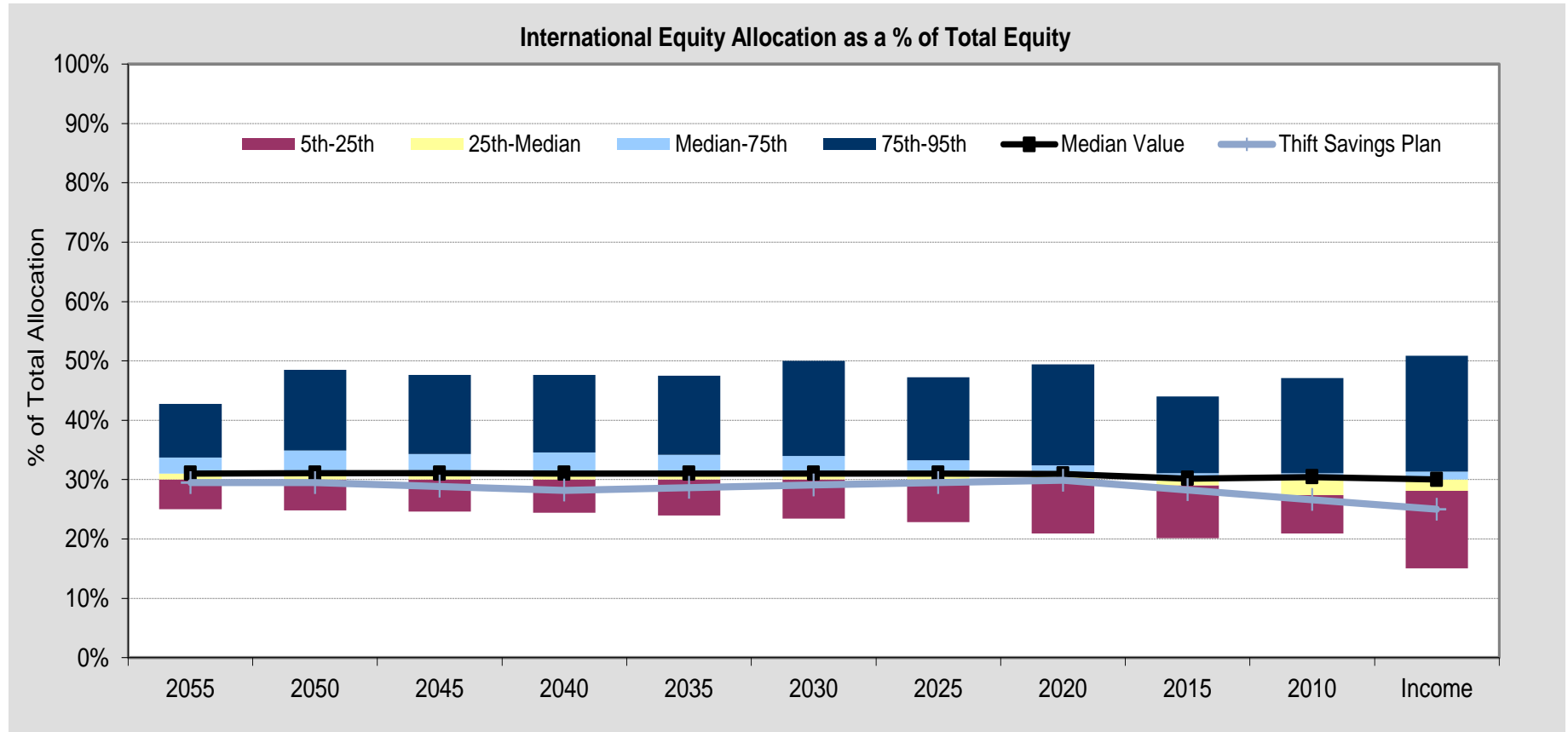
## 100% G Fund for Fixed Income

Allocations	2050 Portfolio	2040 Portfolio	2030 Portfolio	2020 Portfolio	Income Portfolio
C-Fund	42.4	38.4	34.4	27.7	12.0
S-Fund	18.2	16.2	12.4	8.4	3.0
I-Fund	25.4	21.4	19.2	15.4	5.0
F-Fund	0.0	0.0	0.0	0.0	0.0
G-Fund	14.0	24.0	34.0	48.5	80.0
Total	100.0	100.0	100.0	100.0	100.0
<b>Asset Class Ratios</b>					
Pct Equity	86.0	76.0	66.0	51.5	20.0
Int Eq/Tot Eq	29.5	28.2	29.1	29.9	25.0
S-Fund/Domestic Eq	30.0	29.7	26.5	23.3	20.0
F-Fund/Total FI	0.0	0.0	0.0	0.0	0.0

## Summary of Quarterly Market Survey

- Mercer performs a quarterly survey of Target Date Fund providers
- The survey covers 36 Target Date Fund families from 20 providers
- The Thrift Savings Plan asset allocation is somewhat conservative relative to the survey median
  - Lower equity allocations than median across glide path
- The split of international equity vs. total equity is in line with the survey median (approximately 30% of total equity)
  - For most providers, the international equity allocation includes some emerging markets exposure

# International Equity Allocation: Comparison to Mercer Survey



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## Important Notices - *continued*

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Mercer's capital market assumptions are based on the professional judgment of experienced investment consultants and economists and rely on historical experience, economic theory, and our assessment of future developments in the capital markets. Our process for setting asset class expected returns begins with earnings growth and current yields. Equity return assumptions are set by adding a risk premium over bonds. Volatility and correlation assumptions are based more directly on historical experience, except in cases in which the market environment has clearly changed.

Mercer believes that as opportunities in the capital markets change, so do the expected returns for asset classes. A key factor in our process is the level of interest rates, as they combine the market's expectations of inflation and economic growth. In general, as interest rates rise, our expected returns will rise; as interest rates decline, our expected returns will decline. This runs counter to the realized returns as interest rates change and is part of the difference between ex ante and ex post results.

When interest rates change, we may change our assumptions. However, we are cautious about making changes. We have designed our assumptions to be strategic in nature, so they will typically not be adjusted to short-term market spikes. We use our judgment to determine whether interest rate moves are sustainable. In practice, we continuously review our assumptions and work to refine our methodology as we gain additional information relating to the capital markets, but we do not anticipate changes every time interest rates rise in 25 or 50 basis point increments.

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