

HEALTH WEALTH CAREER

FEDERAL THRIFT SAVINGS PLAN

LIFECYCLE FUND ASSET ALLOCATION

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MAKE TOMORROW, TODAY



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- Stochastic Modeling
 - Demographic Assumptions
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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”¹ 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

¹The 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
- Market conditions and long-term capital market outlook

OVERVIEW

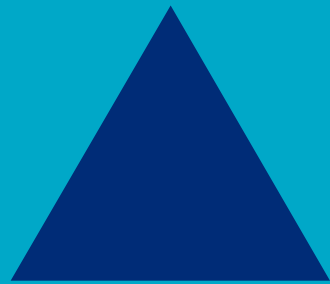
- The purpose of this study is to review the current asset allocations of the lifecycle funds of the Federal Retirement Thrift Savings Plan
- Key objectives and metrics:
 - Provide opportunity to achieve sufficient retirement income for career FERS employees
 - ▣ *Metrics: Range of account balances and 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:

- Given the rise in rates built into the assumptions, G Fund continues to outperform F Fund in the short term; therefore, a higher allocation to the G Fund relative to the F Fund is recommended
- Overweight position in small cap equity (S Fund) less favorable than prior years and shows no improvement in projected outcomes relative to market weight allocations; therefore a reduction in the S Fund to align with market weight is recommended
- Increasing international equity weight has a relatively small positive impact given the current EAFE benchmark for the I Fund; therefore, a slight increase in the I Fund allocation is recommended to reach a consistent 30% of equity across the L Funds
- Adding equity along the glide path improves projected account balances, but adds to capital preservation risk at retirement; therefore, no change is recommended

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 2.4%
 - Inflation is 2.2%
 - For equities, the table below breaks down the components for our equity assumptions

	C Fund	S Fund	I Fund
Inflation	2.2%	2.2%	1.8%
Real Earnings Growth	2.3%	3.8%	2.3%
Dividend/Income	2.7%	1.8%	2.7%
P/E Expansion(Contraction)	-0.5%	-1.1%	0.0%
Currency Impact	0.0%	0.0%	0.8%
Total	6.7%	6.7%	7.6%

APPLYING CAPITAL MARKET ASSUMPTIONS:

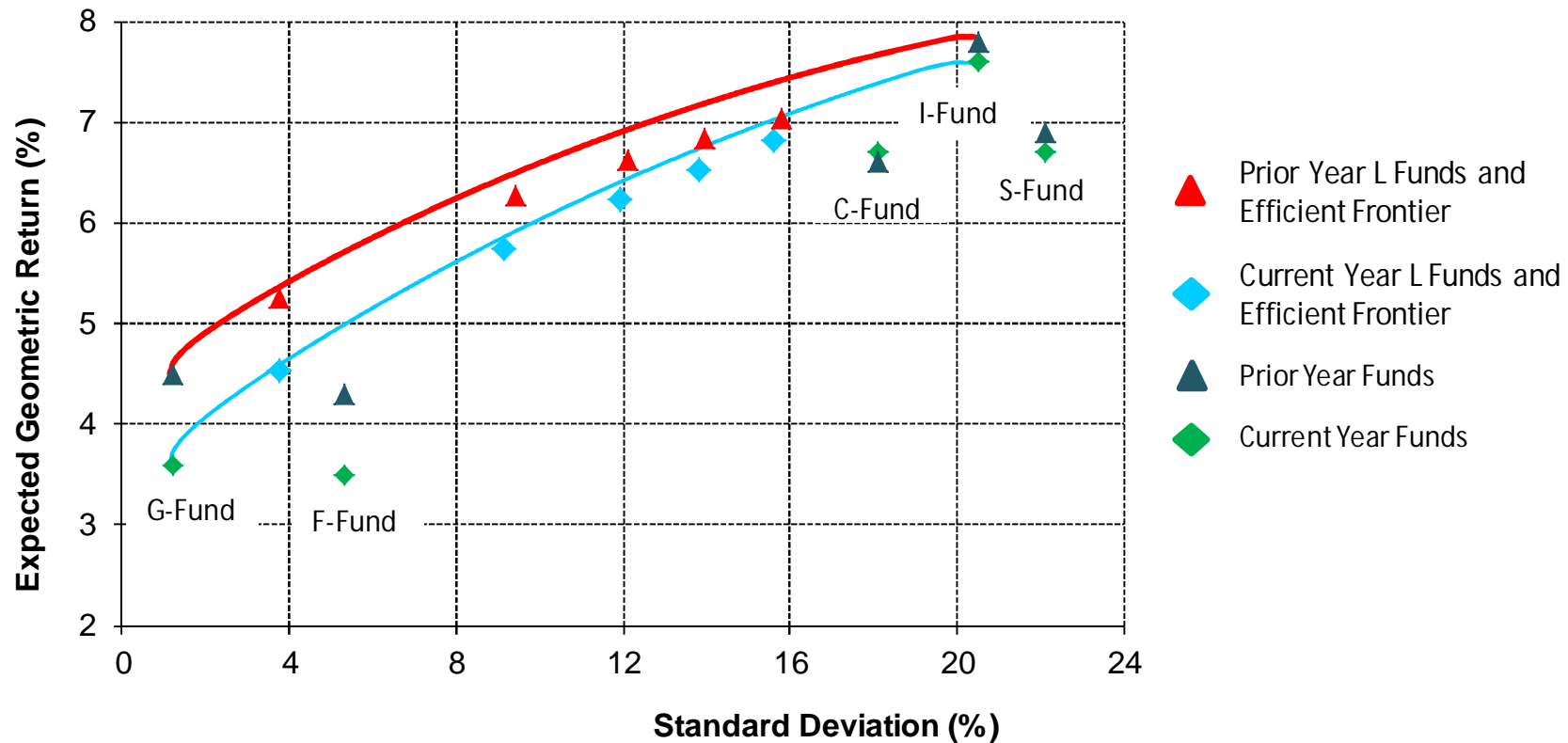
- Using our capital market assumptions and statistical modeling, we calculated expected risk and return for each of the five core funds

	Geometric Return	Change in Return from 2014 Study	Standard Deviation	Interest and Dividend Income
C Fund: Large Cap Equity	6.7%	0.1%	18.1%	1.9%
S Fund: Small Cap Equity	6.7%	(0.2%)	22.1%	1.5%
I Fund: International Equity	7.6%	(0.2%)	20.5%	3.4%
F Fund: Broad Market FI	3.5%	(0.8%)	5.3%	2.1%
G Fund: Government Yields	3.6%	(0.9%)	1.2%	1.9%

- 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
C Fund	1.00				
S Fund	0.91	1.00			
I Fund	0.77	0.72	1.00		
F Fund	0.11	0.10	0.03	1.00	
G Fund	0.00	0.00	0.00	-0.10	1.00

POSITION OF LIFECYCLE FUNDS ON THE EFFICIENT FRONTIER: INCLUDING 2014 AND 2015 (20-YEAR EXPECTED RETURNS)



- Return expectations have declined from prior year
- Lower return assumptions partially driven by lower inflation expectations, which mitigates the impact on inflation-adjusted participant outcomes
- Points would tend to move toward efficient frontier by increasing the percentage of fixed income allocated to the G Fund and the percentage of equity allocated to the I Fund

STOCHASTIC MODELING



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

2014 Study - Based upon 2012/2013 OPM Data (FERS Employees)

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%

2015 Study - Based upon 2014 OPM Data (FERS employees)

Fund	Target Demographic by Age	Age	Salary	Account Balance	Starting Contribution Rate	Salary Growth
2020	51-60	56	\$ 79,000	\$ 170,000	7.40%	3.70%
2030	41-50	46	\$ 78,000	\$ 120,000	6.30%	3.70%
2040	31-40	36	\$ 72,000	\$ 60,000	5.50%	3.70%
2050	<31	26	\$ 58,000	\$ 20,000	4.80%	3.70%

- Salary growth rate of 3.7% is based on OPM long term assumption of 1.5% real wage growth and assumed inflation rate of 2.2%; difference from prior study due to reduced inflation assumption
- Average salary and account balances are based on data from 2014. Account balances have increased due to strong market returns in 2014.
- Estimated contribution rate based on age-range averages across all FERS employees in 2014. Average deferrals have increased across all age cohorts

GLIDE PATHS CONSIDERED: 2015 STUDY

- Current glide path (allocations as of July 2015)

Allocations	2050 Portfolio	2040 Portfolio	2030 Portfolio	2020 Portfolio	Income Portfolio
C-Fund	42.0	38.0	34.0	27.0	12.0
S-Fund	18.0	16.0	12.0	8.0	3.0
I-Fund	25.0	21.0	19.0	15.0	5.0
F-Fund	5.1	6.2	6.1	5.6	6.00
G-Fund	9.9	18.8	28.9	44.4	74.00
Total	100.0	100.0	100.0	100.0	100.0
Asset Class Ratios					
Percent Equity	85.0	75.0	65.0	50.0	20.0
Int Eq/Tot Eq	29.4	28.0	29.2	30.0	25.0
S-Fund/Domestic Eq	30.0	29.6	26.1	22.9	20.0
F-Fund/Total FI	34.0	24.8	17.3	11.2	7.5

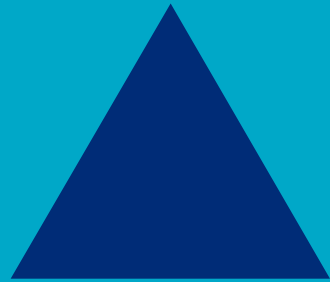
- Alternative glide paths reviewed in four groups

Summary of Alternative Glide Paths			
Group 1: Test Equity Allocation	Group 2: Test Domestic Equity Structure	Group 3: Test Int'l Equity	Group 4: Test Fixed Income
Equity Decreased by 5%	Small Cap Equity Reduced to 20% of Domestic Equity	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 25% of Domestic Equity		
More Equity in 2040, 2030, and 2020 Funds (5-10%)			

- Final scenario with renewed 5-year temporary shift from F Fund to G Fund starting January 2016, I Fund set to 30% of the growth portfolio, and S Fund set to 25% of domestic equity in 2050 portfolio trending down to 20% by Income portfolio

MODELING RESULTS

EXAMPLE: 2030 FUND



2030 FUND RESULTS

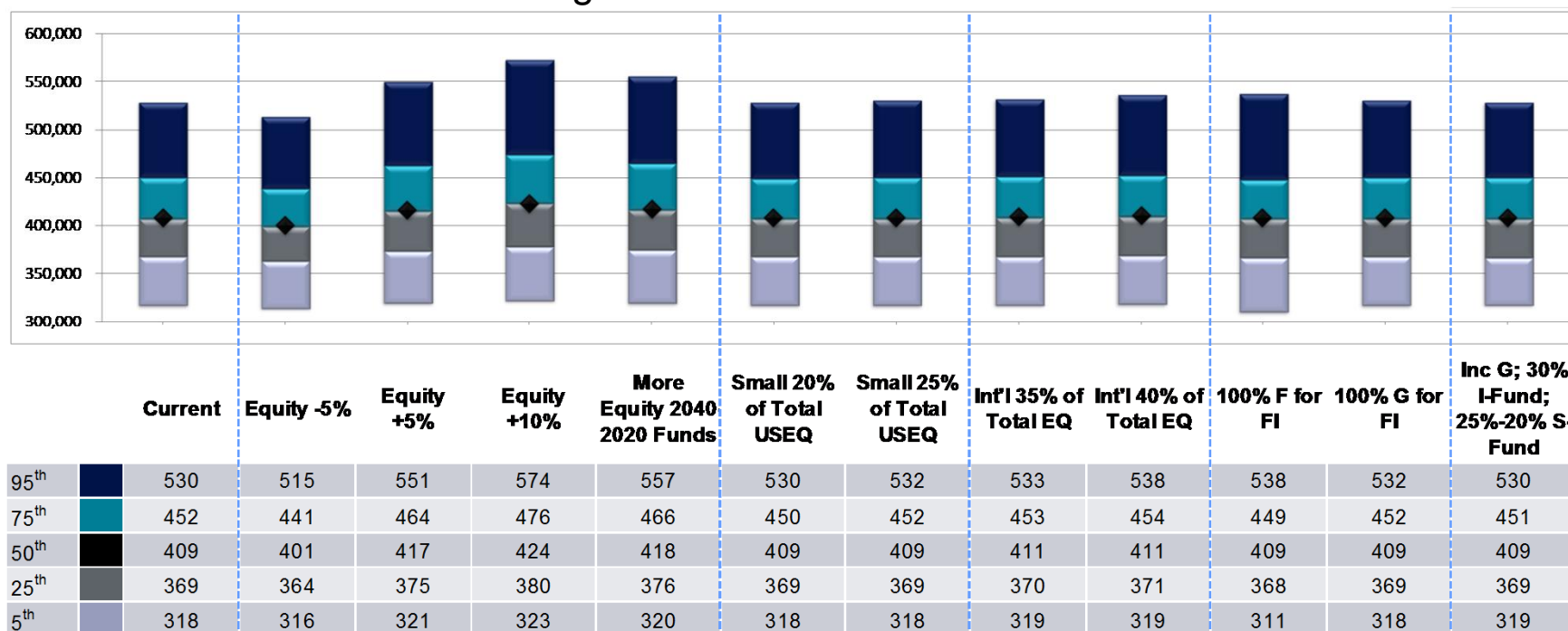
For purposes of this illustration, we selected a representative career FERS participant with entry age 37 and retirement at age 61. Results for a 2030 Lifecycle Fund investor -- 46 yr. old FERS employee with approximately 9 years of tenure, a \$120,000 account balance, and currently earning \$78,000/yr. Assumed real wage growth is 1.5%/yr and inflation is 2.2%.

	<u>Current Glide Path</u>	<u>Recommended</u>
Median Account Balance at 2030 (real \$)	\$408,928	\$409,125
5th Pct Account Balance at 2030 (real \$)	\$318,114	\$318,867
TSP Median Replacement Ratio at 2030	25%	25%
TSP 5th Pct Replacement Ratio at 2030	19%	19%
Total FERS Median Replacement Ratio* at 2030	71%	71%
Total FERS 5th Pct Replacement Ratio* at 2030	63%	63%
Probability of Decline over Final 2 Yrs.	4.80%	4.80%
Assume post-retirement spending is 80% of final inflation adjusted salary.		
Probability account depleted - age 80	69.40%	67.40%
Probability account depleted - age 90	95.30%	95.10%

* Includes estimated replacement from Social Security (20% to 23%) and FERS defined benefit (24%)

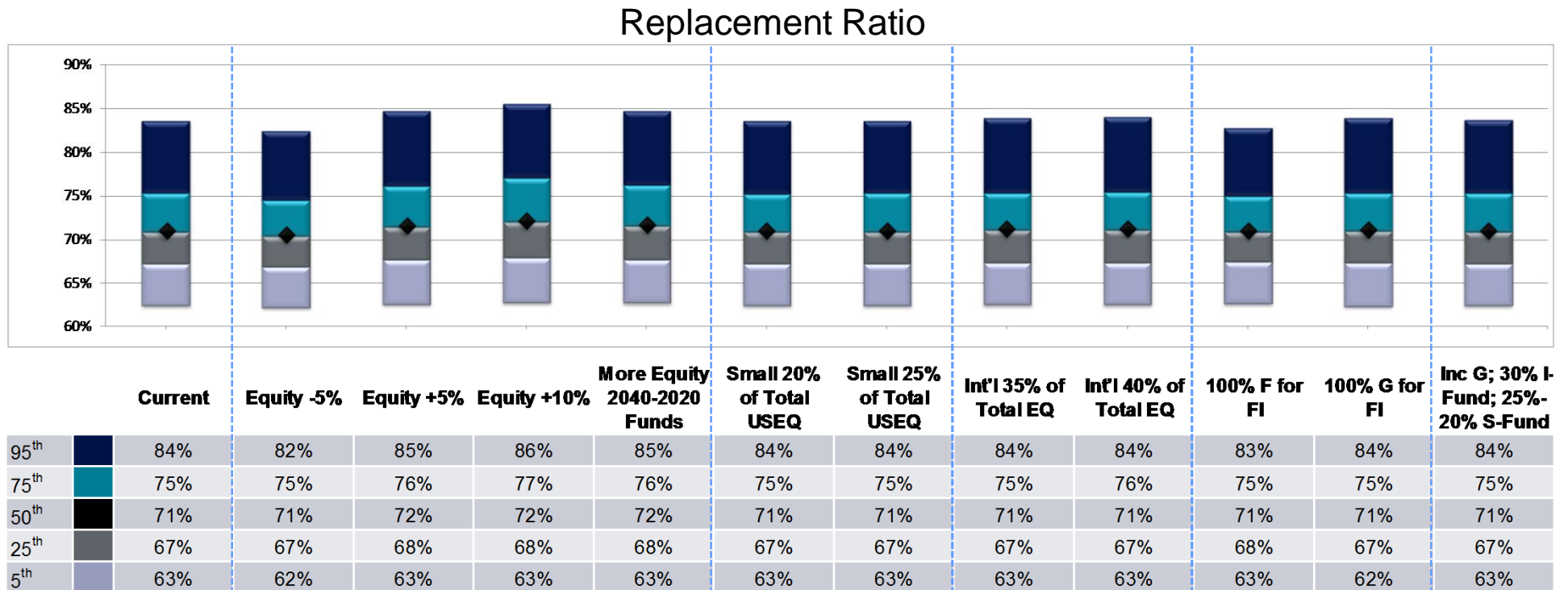
SUMMARY OF REAL (INFLATION-ADJUSTED) ACCOUNT BALANCES AT MATURITY: 15 YEARS TO RETIREMENT (2030 FUND)

Range of Real Account Balances



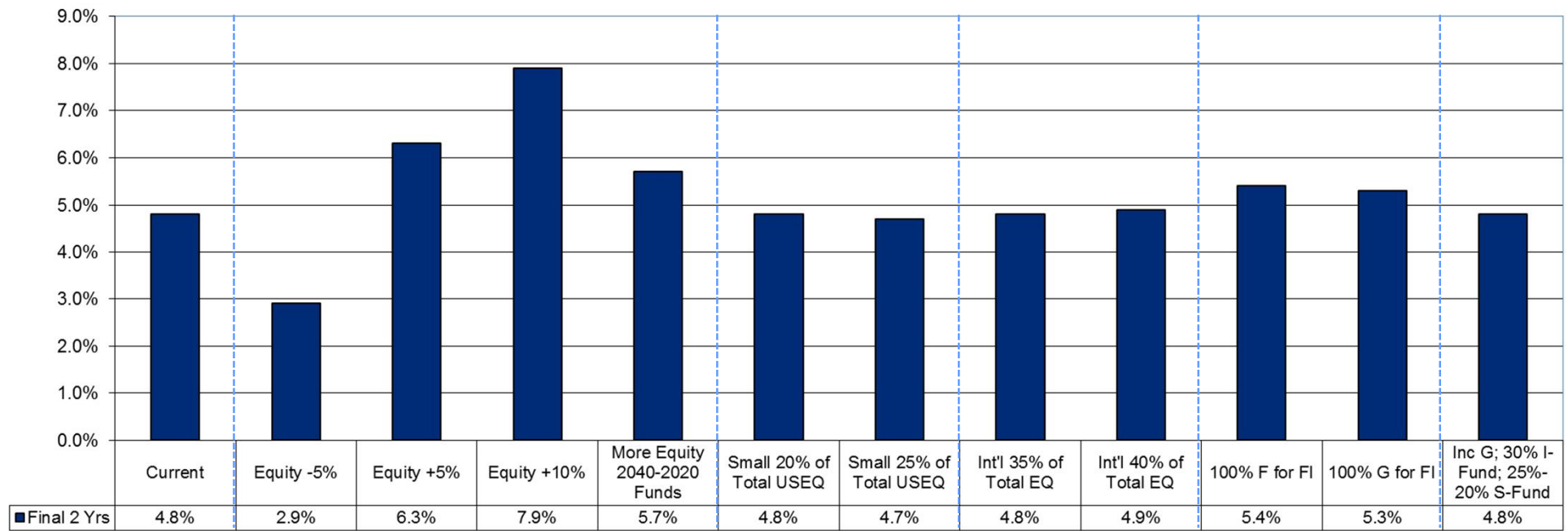
- Higher equity allocations provide improvement in account balances across range of outcomes
- Allocation to small cap does not have significant impact for shorter dated funds

RANGE OF REPLACEMENT RATIOS AT MATURITY: 15 YEARS TO RETIREMENT (2030 FUND)



- Higher equity allocations provide improvement in replacement ratios across range of outcomes
- Allocation to small cap does not have significant impact for shorter dated funds

PROBABILITY OF DECLINE IN ACCOUNT BALANCE IN FINAL TWO YEARS BEFORE MATURITY, IN REAL (INFLATION-ADJUSTED) TERMS: 2030 FUND

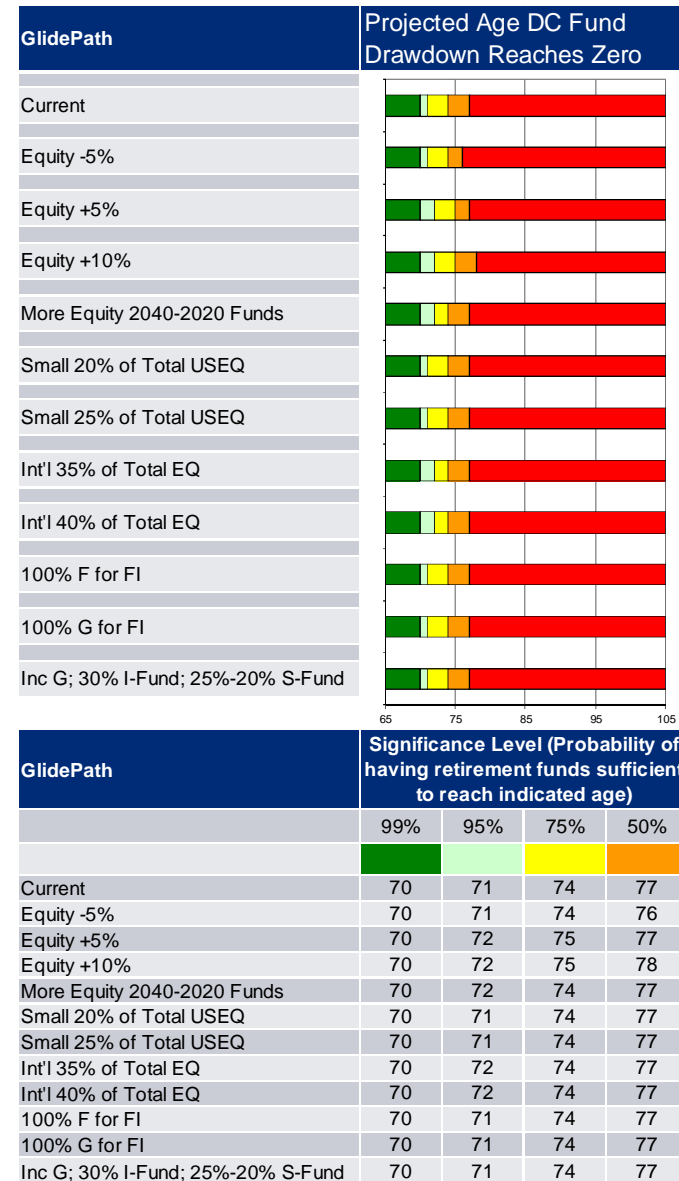


Probability of Loss in Final Two Years (Real)

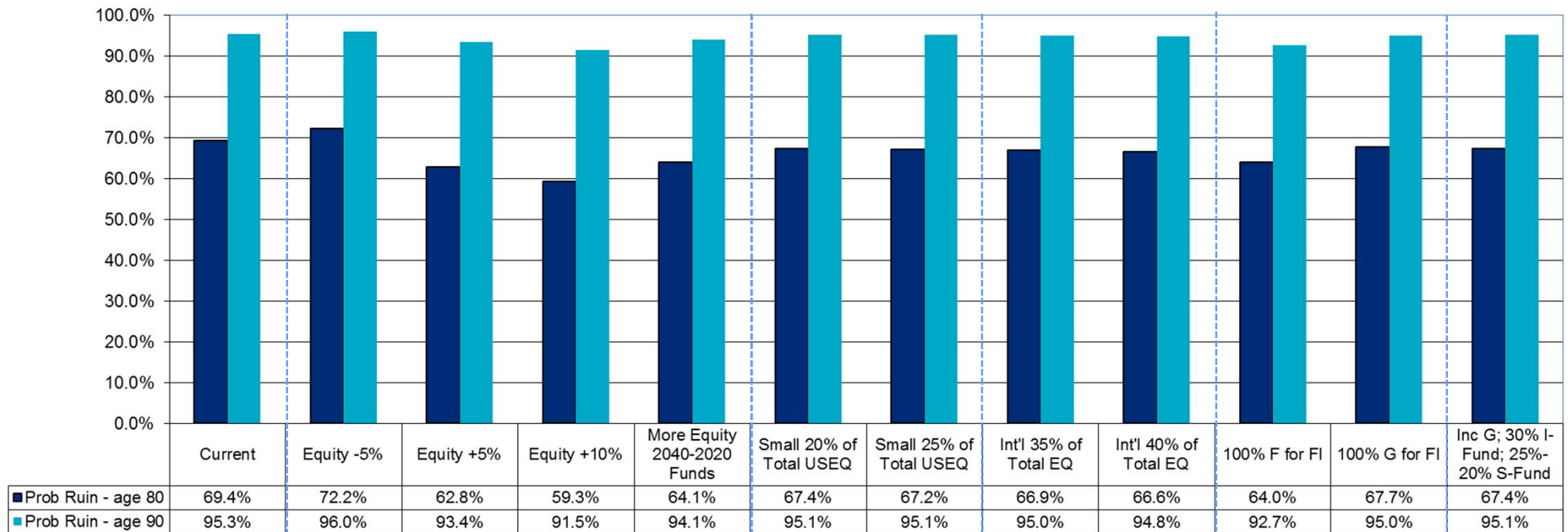
- This measure is influenced by the size of account balance as well as the size of the contributions
- Lower equity glide paths reduce the probability of a decline in account balances, while the higher equity glide paths increase the probability of decline

EXPECTED ACCOUNT DEPLETION AGES: 2030 FUND

- Assumes retirement spending budget of 80% of final pay at retirement
- Under median outcome, account expected to last 16 years post-retirement
- 1% chance of depleting DC assets within 9 years post-retirement with current glide path
- Outcomes slightly improved with higher equity allocation



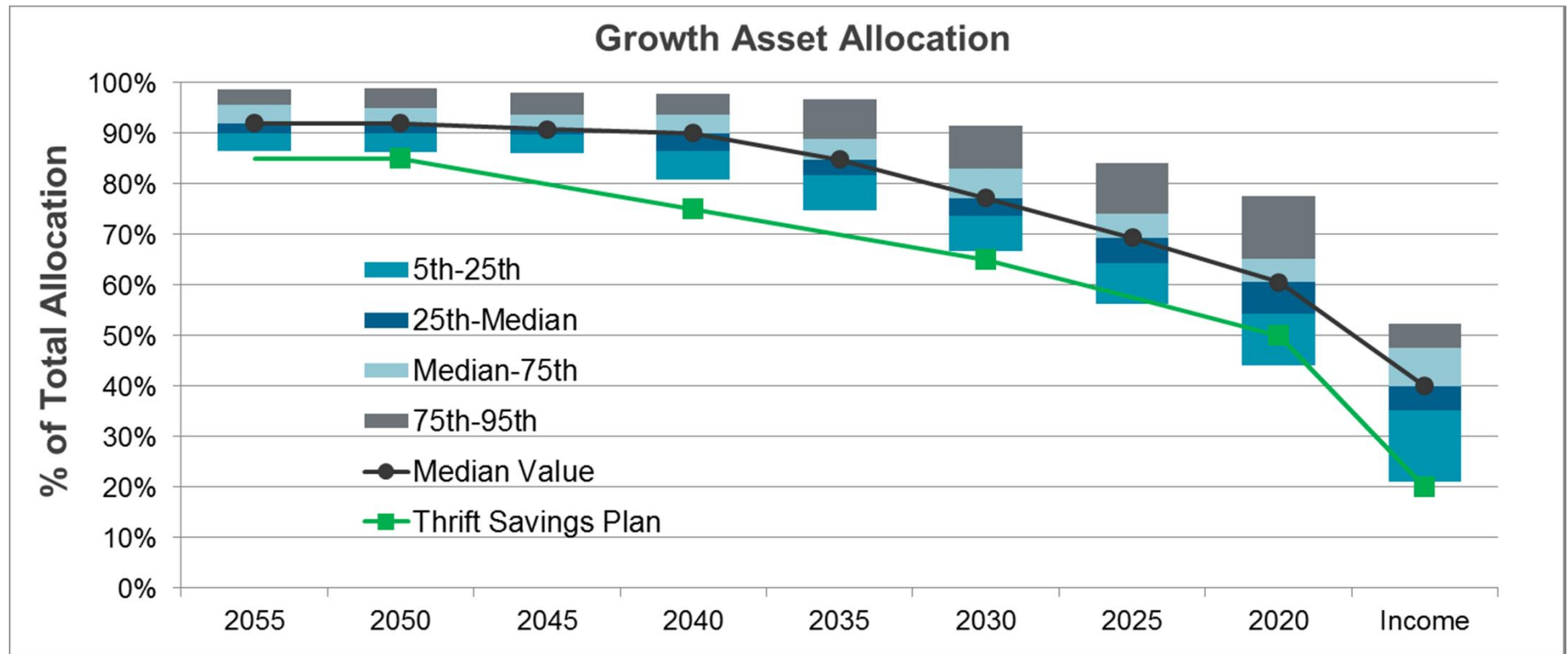
PROBABILITY OF DEPLETING DC ASSETS BY AGE 80 AND 90: 2030 FUND



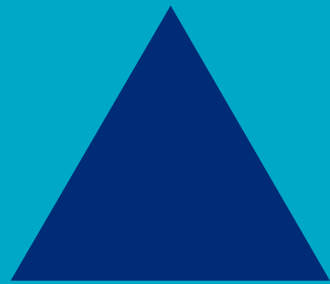
Probability of Depleting DC Assets

- Probability of depleting DC assets by age 80 can be decreased by taking more risk
- Probability of depleting DC assets by age 90 is 90+% for all investment options

EQUITY ALLOCATION: COMPARISON TO MERCER SURVEY



RECOMMENDATIONS



FINAL SCENARIO

- Based upon analysis and current market conditions, the following allocations are recommended:
 - Renewal of temporary shift from F Fund to G Fund due to continued low interest rate environment

Percentage Allocation to G-Fund vs Total FI					
	2050	2040	2030	2020	Income
	Portfolio	Portfolio	Portfolio	Portfolio	Portfolio
Temporary Shift Begin (Jan '16)	80%	80%	85%	90%	93%
Temporary Shift End (Jan '21)	54%	72%	83%	93%	93%
Total FI Allocation (Jul '15)	15%	25%	35%	50%	80%

- Change allocation of I Fund to 30% of growth assets for all L Funds
- Decrease S Fund allocation for longer dated funds to 25% of domestic equities trending down to 20% to align with market cap

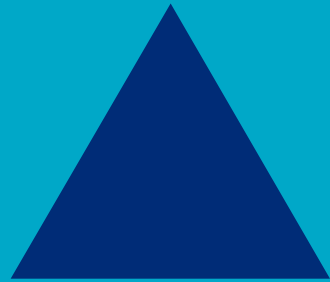
GLIDE PATH FINAL SCENARIO

- Final glide path (allocations as of January 2016)

	2050	2040	2030	2020	Income
Allocations	Portfolio	Portfolio	Portfolio	Portfolio	Portfolio
C-Fund	44.4	39.8	34.9	26.0	11.2
S-Fund	14.8	12.4	10.0	6.9	2.8
I-Fund	25.3	22.3	19.3	14.1	6.0
F-Fund	3.1	5.1	5.4	5.3	6.0
G-Fund	12.4	20.4	30.4	47.7	74.0
Total	100.0	100.0	100.0	100.0	100.0
Asset Class Ratios					
Percent Equity	84.5	74.5	64.2	47.0	20.0
Int Eq/Tot Eq	30.0	30.0	30.0	30.0	30.0
S-Fund/Domestic Eq	25.0	23.8	22.3	21.0	20.0
F-Fund/Total FI	20.0	20.0	15.1	10.0	7.5

APPENDIX

ALTERNATIVE GLIDE PATHS MARKET SURVEY



CURRENT ASSET ALLOCATION OF ALTERNATIVE GLIDE PATHS

Decrease Equity 5%

Allocations	2050 Portfolio	2040 Portfolio	2030 Portfolio	2020 Portfolio	Income Portfolio
C-Fund	39.6	35.5	31.4	24.3	8.9
S-Fund	16.9	14.9	11.1	7.2	2.3
I-Fund	23.5	19.6	17.5	13.5	3.8
F-Fund	6.8	7.4	6.9	6.2	6.4
G-Fund	13.2	22.6	33.1	48.8	78.6
Total	100.0	100.0	100.0	100.0	100.0
Asset Class Ratios					
Percent Equity	80.0	70.0	60.0	45.0	15.0
Int Eq/Tot Eq	29.4	28.0	29.2	30.0	25.3
S-Fund/Domestic Eq	29.9	29.6	26.1	22.9	20.5
F-Fund/Total FI	34.0	24.8	17.3	11.2	7.5

Increase Equity 5%

Allocations	2050 Portfolio	2040 Portfolio	2030 Portfolio	2020 Portfolio	Income Portfolio
C-Fund	44.4	40.5	36.6	29.7	14.9
S-Fund	19.1	17.1	12.9	8.8	3.8
I-Fund	26.5	22.4	20.5	16.5	6.3
F-Fund	3.4	5.0	5.2	5.0	5.6
G-Fund	6.6	15.0	24.8	40.0	69.4
Total	100.0	100.0	100.0	100.0	100.0
Asset Class Ratios					
Percent Equity	90.0	80.0	70.0	55.0	25.0
Int Eq/Tot Eq	29.4	28.0	29.3	30.0	25.2
S-Fund/Domestic Eq	30.1	29.7	26.1	22.9	20.3
F-Fund/Total FI	34.0	24.8	17.3	11.2	7.5

Increase Equity 10%

Allocations	2050 Portfolio	2040 Portfolio	2030 Portfolio	2020 Portfolio	Income Portfolio
C-Fund	47.0	43.1	39.3	32.4	18.0
S-Fund	20.1	18.1	13.8	9.6	4.5
I-Fund	27.9	23.8	21.9	18.0	7.5
F-Fund	1.7	3.7	4.3	4.5	5.3
G-Fund	3.3	11.3	20.7	35.5	64.8
Total	100.0	100.0	100.0	100.0	100.0
Asset Class Ratios					
Percent Equity	95.0	85.0	75.0	60.0	30.0
Int Eq/Tot Eq	29.4	28.0	29.2	30.0	25.0
S-Fund/Domestic Eq	30.0	29.6	26.0	22.9	20.0
F-Fund/Total FI	34.0	24.8	17.3	11.2	7.5

More Equity 2040 - 2020

Allocations	2050 Portfolio	2040 Portfolio	2030 Portfolio	2020 Portfolio	Income Portfolio
C-Fund	42.0	40.5	39.3	29.7	12.0
S-Fund	18.0	17.1	13.8	8.8	3.0
I-Fund	25.0	22.4	21.9	16.5	5.0
F-Fund	5.1	5.0	4.3	5.0	6.0
G-Fund	9.9	15.0	20.7	40.0	74.0
Total	100.0	100.0	100.0	100.0	100.0
Asset Class Ratios					
Percent Equity	85.0	80.0	75.0	55.0	20.0
Int Eq/Tot Eq	29.4	28.0	29.2	30.0	25.0
S-Fund/Domestic Eq	30.0	29.7	26.0	22.9	20.0
F-Fund/Total FI	34.0	24.8	17.3	11.2	7.5

CURRENT ASSET ALLOCATION OF ALTERNATIVE GLIDE PATHS

International Equity Increased to 35% of Total Equity

Allocations	2050 Portfolio	2040 Portfolio	2030 Portfolio	2020 Portfolio	Income Portfolio
C-Fund	38.7	34.4	31.2	25.1	10.4
S-Fund	16.5	14.3	11.0	7.4	2.6
I-Fund	29.8	26.3	22.8	17.5	7.0
F-Fund	5.1	6.2	6.1	5.6	6.0
G-Fund	9.9	18.8	28.9	44.4	74.0
Total	100.0	100.0	100.0	100.0	100.0
Asset Class Ratios					
Percent Equity	85.0	75.0	65.0	50.0	20.0
Int Eq/Tot Eq	35.0	35.0	35.0	35.0	35.0
S-Fund/Domestic Eq	29.9	29.4	26.1	22.8	20.0
F-Fund/Total FI	34.0	24.8	17.4	11.2	7.5

International Equity Increased to 40% of Total Equity

Allocations	2050 Portfolio	2040 Portfolio	2030 Portfolio	2020 Portfolio	Income Portfolio
C-Fund	35.7	31.7	28.8	23.1	9.6
S-Fund	15.3	13.3	10.2	6.9	2.4
I-Fund	34.0	30.0	26.0	20.0	8.0
F-Fund	5.1	6.2	6.1	5.6	6.0
G-Fund	9.9	18.8	28.9	44.4	74.0
Total	100.0	100.0	100.0	100.0	100.0
Asset Class Ratios					
Percent Equity	85.0	75.0	65.0	50.0	20.0
Int Eq/Tot Eq	40.0	40.0	40.0	40.0	40.0
S-Fund/Domestic Eq	30.0	29.6	26.2	23.0	20.0
F-Fund/Total FI	34.0	24.8	17.3	11.2	7.5

Small Cap Equity to 20% of Domestic Equity

Allocations	2050 Portfolio	2040 Portfolio	2030 Portfolio	2020 Portfolio	Income Portfolio
C-Fund	48.0	43.2	36.8	28.0	12.0
S-Fund	12.0	10.8	9.2	7.0	3.0
I-Fund	25.0	21.0	19.0	15.0	5.0
F-Fund	5.1	6.2	6.1	5.6	6.0
G-Fund	9.9	18.8	28.9	44.4	74.0
Total	100.0	100.0	100.0	100.0	100.0
Asset Class Ratios					
Percent Equity	85.0	75.0	65.0	50.0	20.0
Int Eq/Tot Eq	29.4	28.0	29.2	30.0	25.0
S-Fund/Domestic Eq	20.0	20.0	20.0	20.0	20.0
F-Fund/Total FI	34.0	24.8	17.3	11.2	7.5

Small Cap Equity to 25% of Domestic Equity

Allocations	2050 Portfolio	2040 Portfolio	2030 Portfolio	2020 Portfolio	Income Portfolio
C-Fund	44.6	39.4	34.1	26.2	11.2
S-Fund	14.9	13.1	11.4	8.8	3.8
I-Fund	25.5	22.5	19.5	15.0	5.0
F-Fund	5.1	6.2	6.1	5.6	6.0
G-Fund	9.9	18.8	28.9	44.4	74.0
Total	100.0	100.0	100.0	100.0	100.0
Asset Class Ratios					
Percent Equity	85.0	75.0	65.0	50.0	20.0
Int Eq/Tot Eq	30.0	30.0	30.0	30.0	25.0
S-Fund/Domestic Eq	25.0	25.0	25.0	25.0	25.0
F-Fund/Total FI	34.0	24.8	17.4	11.2	7.5

CURRENT ASSET ALLOCATION OF ALTERNATIVE GLIDE PATHS

100% F Fund for Fixed Income

	2050	2040	2030	2020	Income
Allocations	Portfolio	Portfolio	Portfolio	Portfolio	Portfolio
C-Fund	42.0	38.0	34.0	27.0	12.0
S-Fund	18.0	16.0	12.0	8.0	3.0
I-Fund	25.0	21.0	19.0	15.0	5.0
F-Fund	15.0	25.0	35.0	50.0	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
Asset Class Ratios					
Percent Equity	85.0	75.0	65.0	50.0	20.0
Int Eq/Tot Eq	29.4	28.0	29.2	30.0	25.0
S-Fund/Domestic Eq	30.0	29.6	26.1	22.9	20.0
F-Fund/Total FI	100.0	100.0	100.0	100.0	100.0

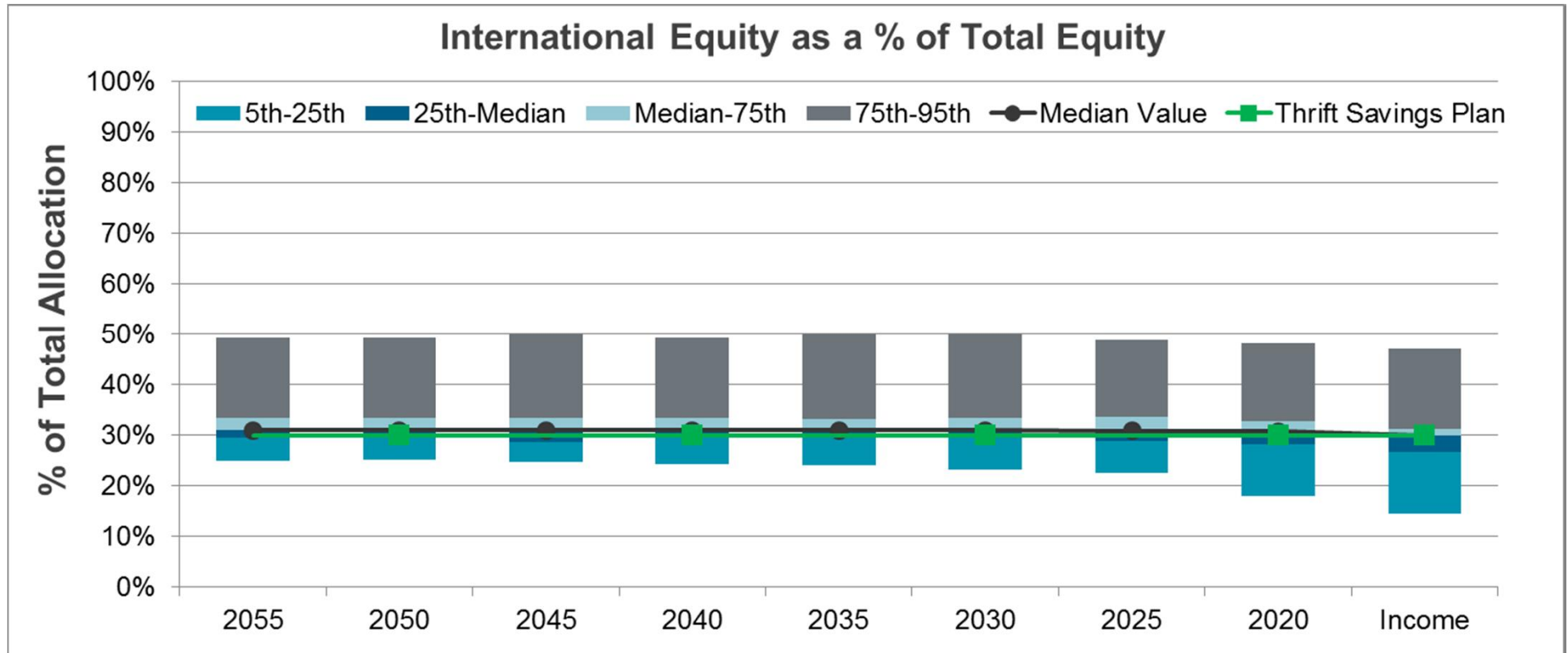
100% G Fund for Fixed Income

	2050	2040	2030	2020	Income
Allocations	Portfolio	Portfolio	Portfolio	Portfolio	Portfolio
C-Fund	42.0	38.0	34.0	27.0	12.0
S-Fund	18.0	16.0	12.0	8.0	3.0
I-Fund	25.0	21.0	19.0	15.0	5.0
F-Fund	0.0	0.0	0.0	0.0	0.0
G-Fund	15.0	25.0	35.0	50.0	80.0
Total	100.0	100.0	100.0	100.0	100.0
Asset Class Ratios					
Percent Equity	85.0	75.0	65.0	50.0	20.0
Int Eq/Tot Eq	29.4	28.0	29.2	30.0	25.0
S-Fund/Domestic Eq	30.0	29.6	26.1	22.9	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 (30% of total equity)
 - For most providers, the international equity allocation includes some emerging markets exposure

INTERNATIONAL EQUITY RECOMMENDATION: COMPARISON TO MERCER SURVEY



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