Callan

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North Carolina Supplemental Retirement Plans

Target Maturity Model Suitability Review

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Overview

- The purpose of this study is to examine the suitability of the GoalMaker model portfolio service for the North Carolina 401(k) and 457 defined contribution plans. The evaluation, using the DOL Tips as a starting point, will evaluate suitability through various lenses, including but not limited to track record, fees and projected outcomes.
- This study looks to establish suitability, not optimality. Though an option may be suitable, this does not imply it is the best possible option. Given the tradeoffs between the various risks faced by participants, no solution can simultaneously address all risks in an optimal fashion.

A Review of the Department of Labor (DOL) Tips

In February 2013, the Employee Benefits Security Administration (EBSA) released its guide on Target Date Retirement Funds – Tips for ERISA Plan Fiduciaries. According to EBSA, the general guidance is geared "to assist plan fiduciaries in selecting and monitoring TDFs and other investment options in 401(k) and similar participant-directed individual account plans."

The guide establishes eight elements for plan sponsors to remember when choosing target date funds:

1
Establish a process for comparing and selecting TDFs

2
Establish a process for the periodic review of selected TDFs

3
Understand the fund's investments — the allocation in different asset classes (stocks, bonds, cash) and individual investments — and how they change over time

4
Review the fund's fees and investment expenses

5
Inquire about whether a custom or non-proprietary target date fund would be a better fit for your plan

6
Develop effective associate communications

7
Take advantage of available sources of information to evaluate the TDF and recommendations you received regarding the TDF selection

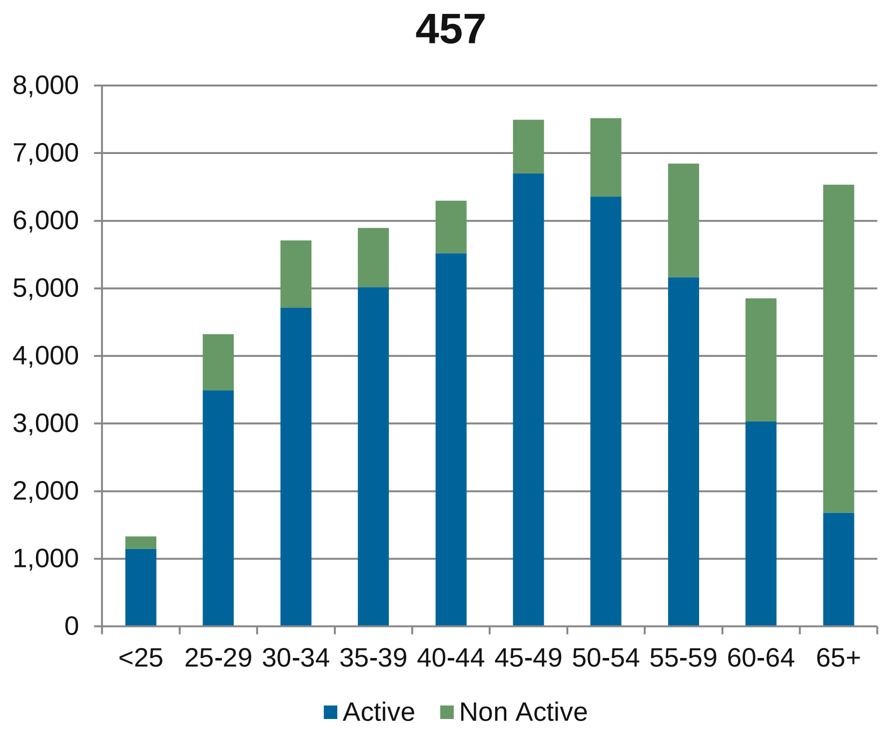
8
Document the process

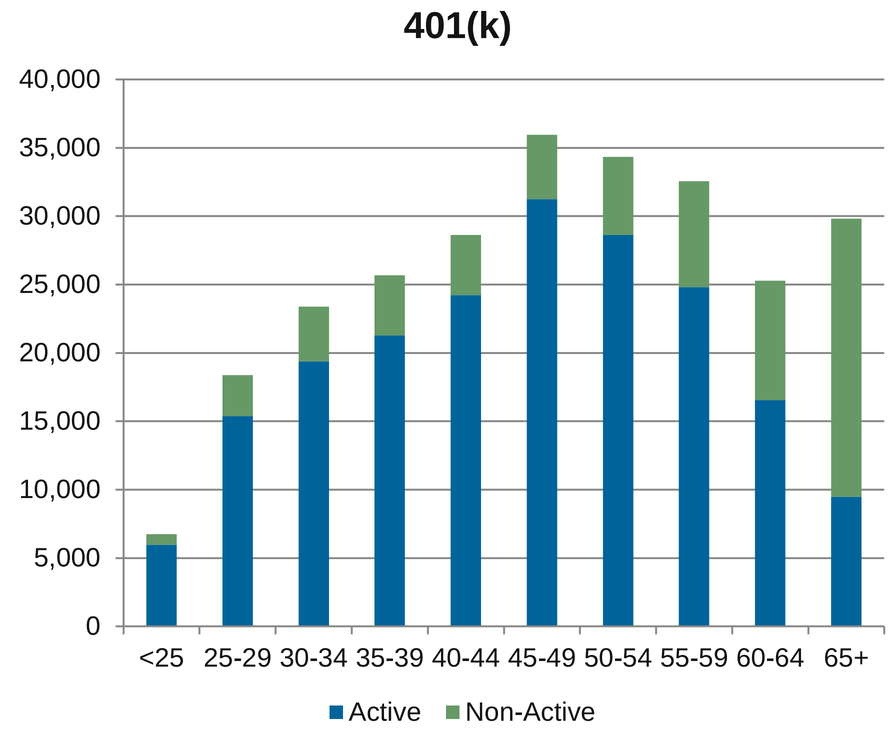
Callan believes **a higher standard** may apply to target date fund decision-making going forward than has been applied in the past. Even for non-ERISA plans, the DOL Tips provide a framework for reviewing the suitability of a target date solution for a specific plan given its demographics and plan design.

Plan Summary

Summary Plan Information (as of 6/30/19)	457	401(k)
Assets	$1.6B	$11.4 billion
Participants	56,872	261,420
Active Participants	42,825	196,921
Eligibility	• Employer offers NC 457 Plan • Full-time, temp or part-time employees • Elected or appointed officials • Rehired retired employees	Contributing members to one of the North Carolina public employees Retirement Systems, including: • TSERS • LGERS • Legislative Retirement System • Consolidated Judicial Retirement System
Recordkeeper	Prudential	
Solution	Prudential GoalMaker	

Underlying Plan Demographics





- The 457 is the smaller of the two plans in terms of assets (see previous slides) as well as the number of participants.
- In both plans the majority of participants are active.
- There are a sizeable number of retirees with balances in both plans. In the 457 those over 65 and non-active (presumably retired) number 4,854 (roughly 9% of all participants). In the 401(k), they number 20,334 or approximately 8% of participants.

Other Benefits

In addition to post-retirement healthcare, many participants in the plans also receive retirement benefits from one of the various defined benefit plans (7 total). For the purposes of this study we will confine our analysis to the largest, the TSERS defined benefit plan. This plan's eligibility is as follows:

- A permanent full-time teacher or employee of a state-supported board of education or community college.
- A permanent employee of the state (or any of its agencies, departments, bureaus or institutions) and work at least 30 hours per week for nine months per year.
- A permanent employee of a charter school that participates in TSERS, and you work at least 30 hours per week for nine months per year.
- The benefit formula for TSERS is as follows:

Average of 4 highest paid years in a row

×

1.82%

×

Years and months of creditable service

Contribution Rates

- As supplemental plans, the defined contribution plans feature lower overall contribution rates relative to plans where the DC plan is primary funding vehicle for retirement.
- There are no matching or employer contributions.
- There is considerable overlap between membership in the two plans.

Average Deferrals by Age and Plan		
Age	457	401(k)
25-29	3.9%	4.0%
30-34	3.9%	4.2%
35-39	4.8%	4.5%
40-44	4.9%	4.8%
45-49	5.4%	5.1%
50-54	6.0%	5.8%
55-59	7.2%	6.3%
60-64	12.1%	7.3%

GoalMaker Overview

GoalMaker Background

- GoalMaker is a model portfolio solution that given various inputs, places participants on one of three glide paths. When a participant enrolls in the service, GoalMaker receives as inputs:
  - Age
  - Expected retirement age (default is 65)
  - Preference for conservative, moderate or aggressive risk tolerance
- Based on these inputs, participants are placed into either the conservative, moderate or aggressive asset allocation. These allocations are made up of the underlying North Carolina plan building blocks.
- A few factors make this solution distinct from a target date series:
  - The rebalancing within GoalMaker functions differently than is common with target date funds. Both typically rebalance to the strategic or target allocation quarterly. However unlike target date funds, the target GoalMaker allocations do not gradually shift over time. Rather, the participant 'jumps' to the new age-based allocation based on their birthday. There are currently 9 such allocations in GoalMaker.
  - The GoalMaker allocations are not unitized rather they are amalgamations of the underlying funds.
- The Supplemental Retirement Board of Trustees is the fiduciary with regard to the methodology and asset allocation underlying GoalMaker.

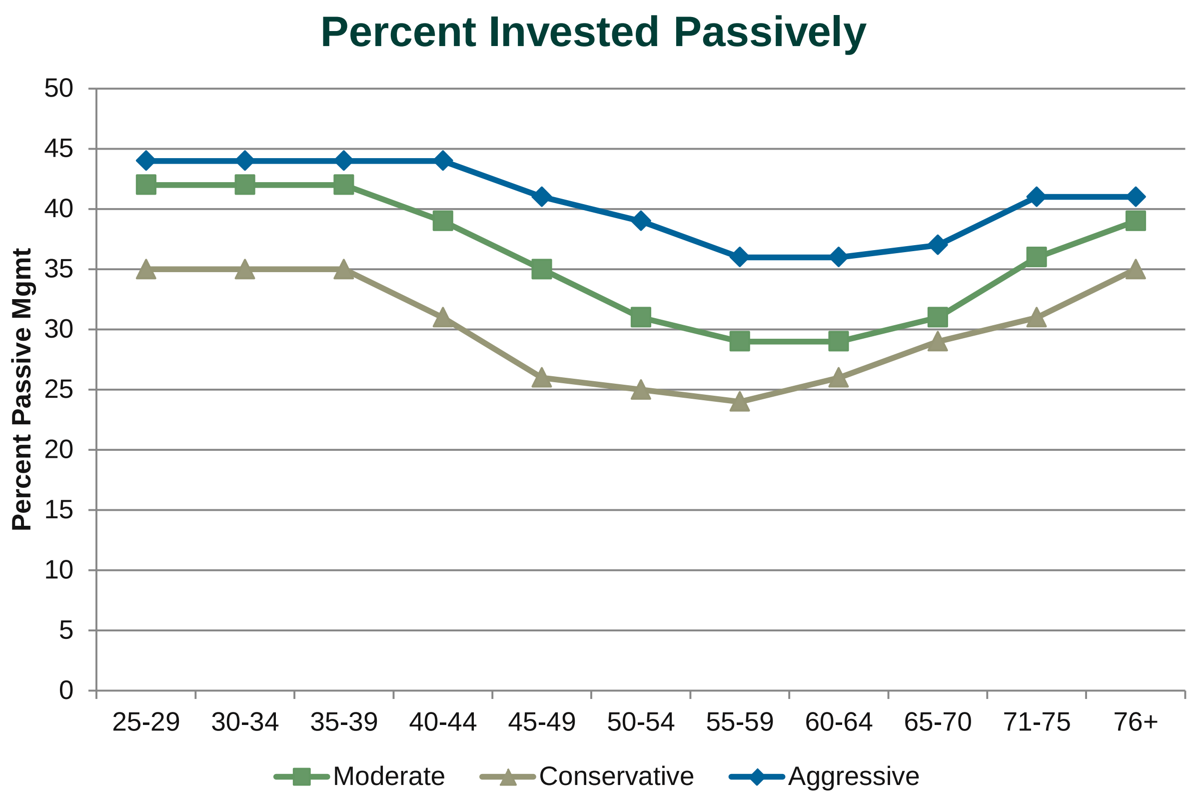
GoalMaker Underlying Building Blocks

- The underlying funds provide diversification at both the asset class level as well as the manager level.
- The GoalMaker portfolios utilize the highlighted funds (with asterisk '*') from the core lineup.

Fund	Manager
***NC Stable Value Fund**	**Galliard**
NC Fixed Income Index	BlackRock (Bloomberg Barclays U.S. Aggregate Bond Index)
***NC Fixed Income Fund**	**TCW & Prudential**
***NC Inflation Responsive Fund**	**BlackRock**
***NC TIPS**	**BlackRock (Bloomberg Barclays 1-10 Year Government Inflation-Linked Bond Index)**
***NC Large Cap Index**	**BlackRock (S&P 500)**
NC Large Cap Core Fund	Hotchkis & Wiley, Macquarie, Sands, Loomis & BlackRock
NC Small/Mid Cap Index	BlackRock (Russell 2500)
***NC Small/Mid Cap Fund**	**Brown Advisory, Wedge, EARNEST Partners & BlackRock**
NC International Index	BlackRock (ACWI ex-US)
***NC International Fund**	**Mondrian & Baillie Gifford**

Underlying Use of Passive Management

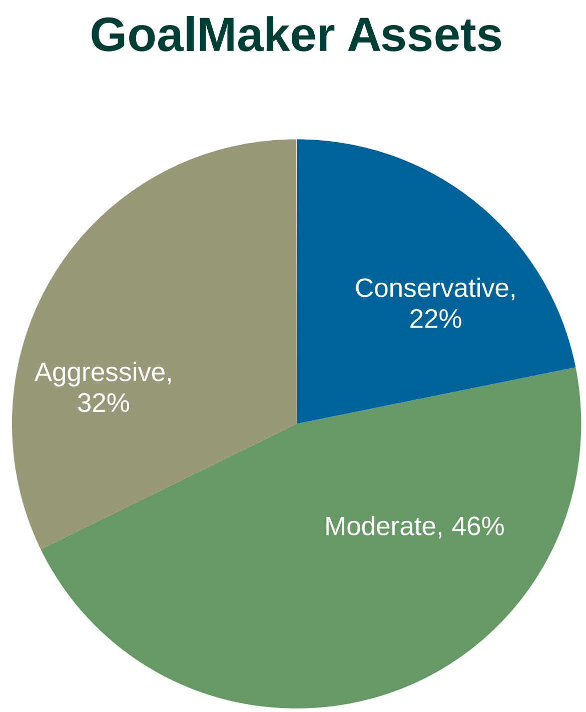
- The percent of passive underlying management ranges from 44% to a low of 24%.
- The underlying use of active and passive aims to utilize active management in asset classes where managers have historically been shown to add value net-of-fees relative to a passive index.



GoalMaker

Positioning with Plans

The GoalMaker portfolios account for $5.2B of the $13B of the combined plans assets (48%). The split among the three paths is as follows:



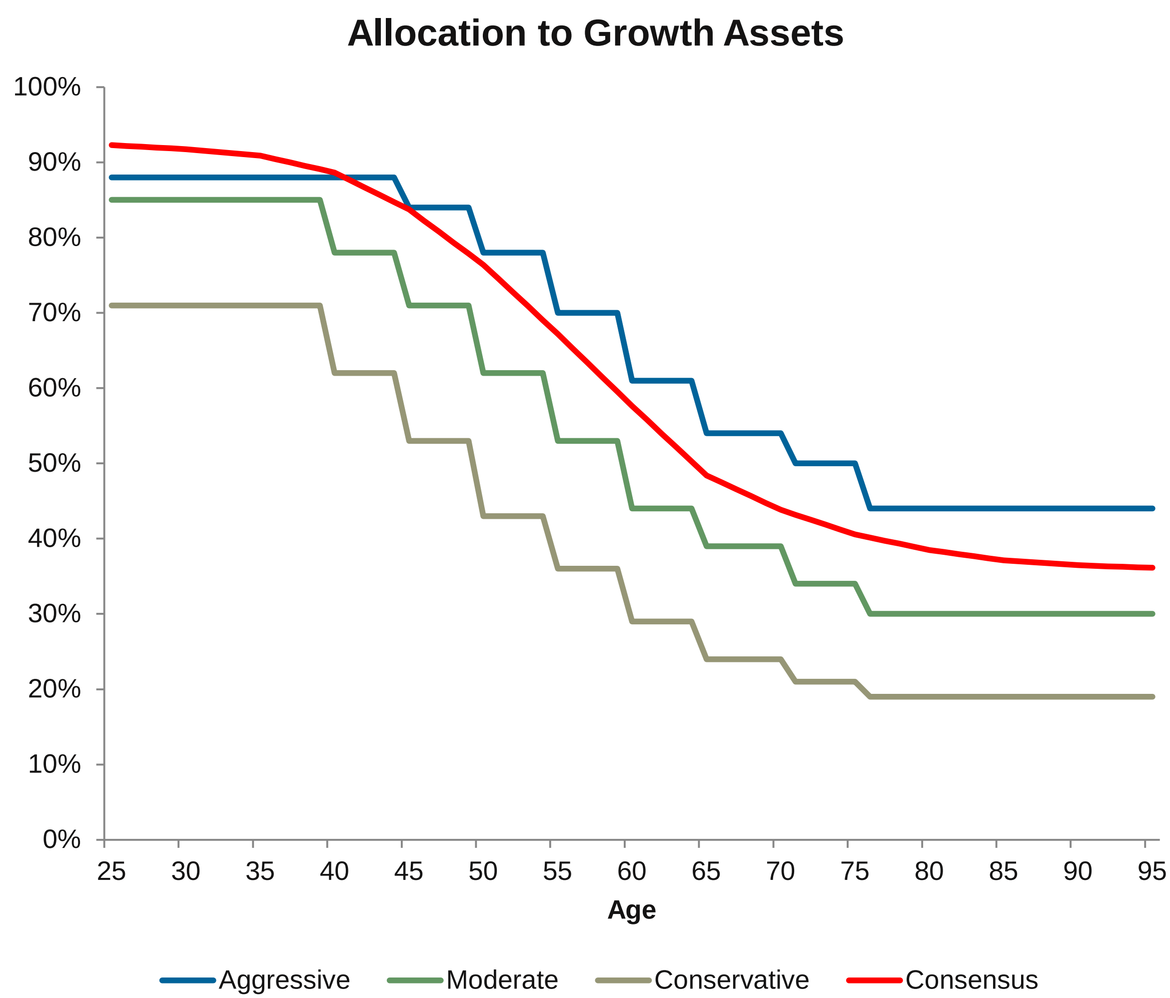
The moderate path is utilized as the default.

Underlying Allocations

Growth Assets*

- The allocation to growth assets includes not only equity, but also any explicit allocation to additional asset classes that behave like equity such as high yield fixed income

- GoalMaker portfolios provide a range of allocation choices that are both more aggressive and more conservative relative to the Callan Consensus*.
- The 'moderate' allocation has a more conservative orientation versus the Callan Consensus.

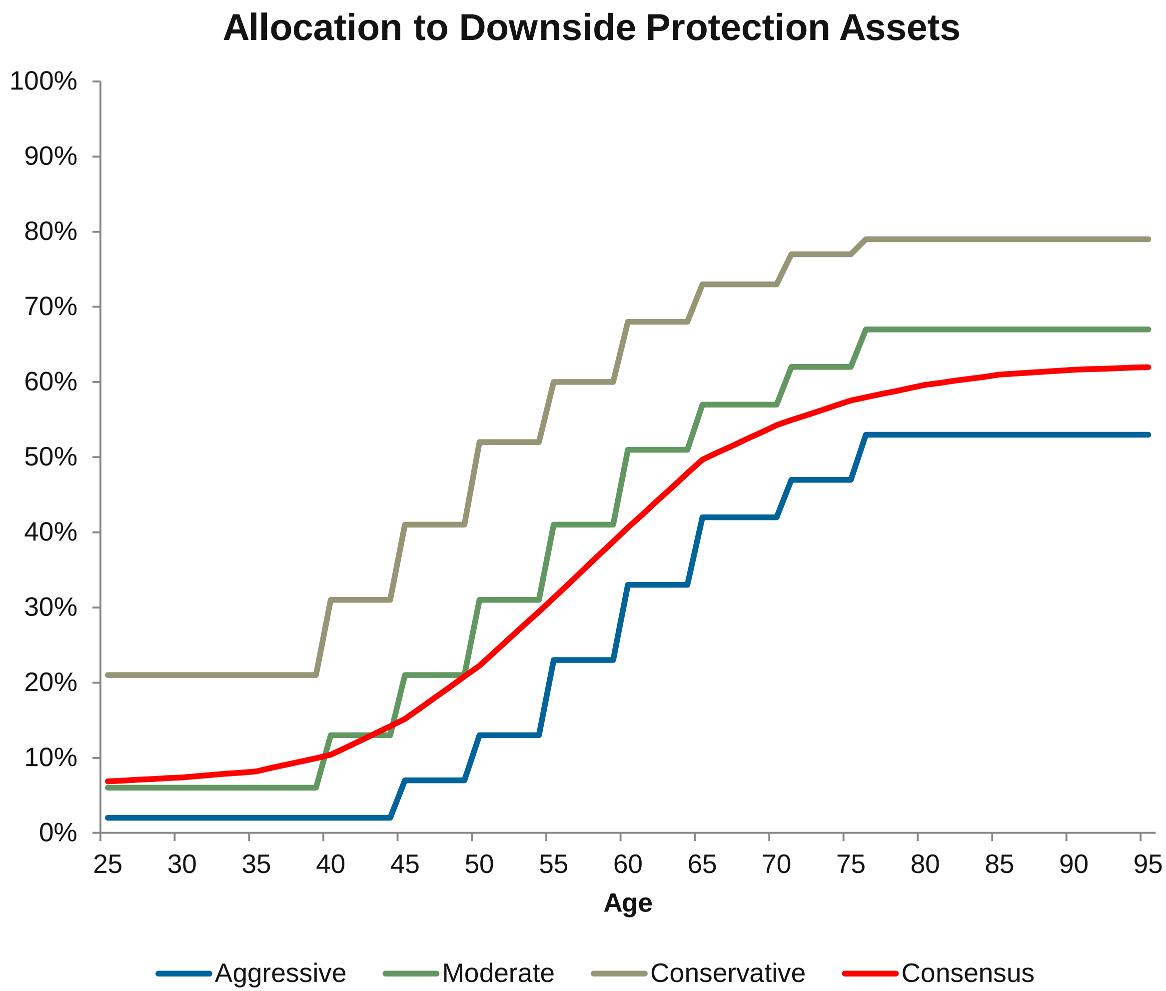


*The Callan Consensus glide path is a market average glide path made up of roughly 70 providers' allocations. A more detailed look at 'growth' assets is contained in Appendix III

Underlying Allocations

Downside Protection Assets*

- The allocation to downside protection assets includes allocations to fixed income as well as capital preservation and TIPS.
- Within the GoalMaker portfolios the downside protection allocation is composed of core fixed income, TIPS and stable value.
- Both the moderate and conservative paths feature generally higher allocations to downside protection assets.

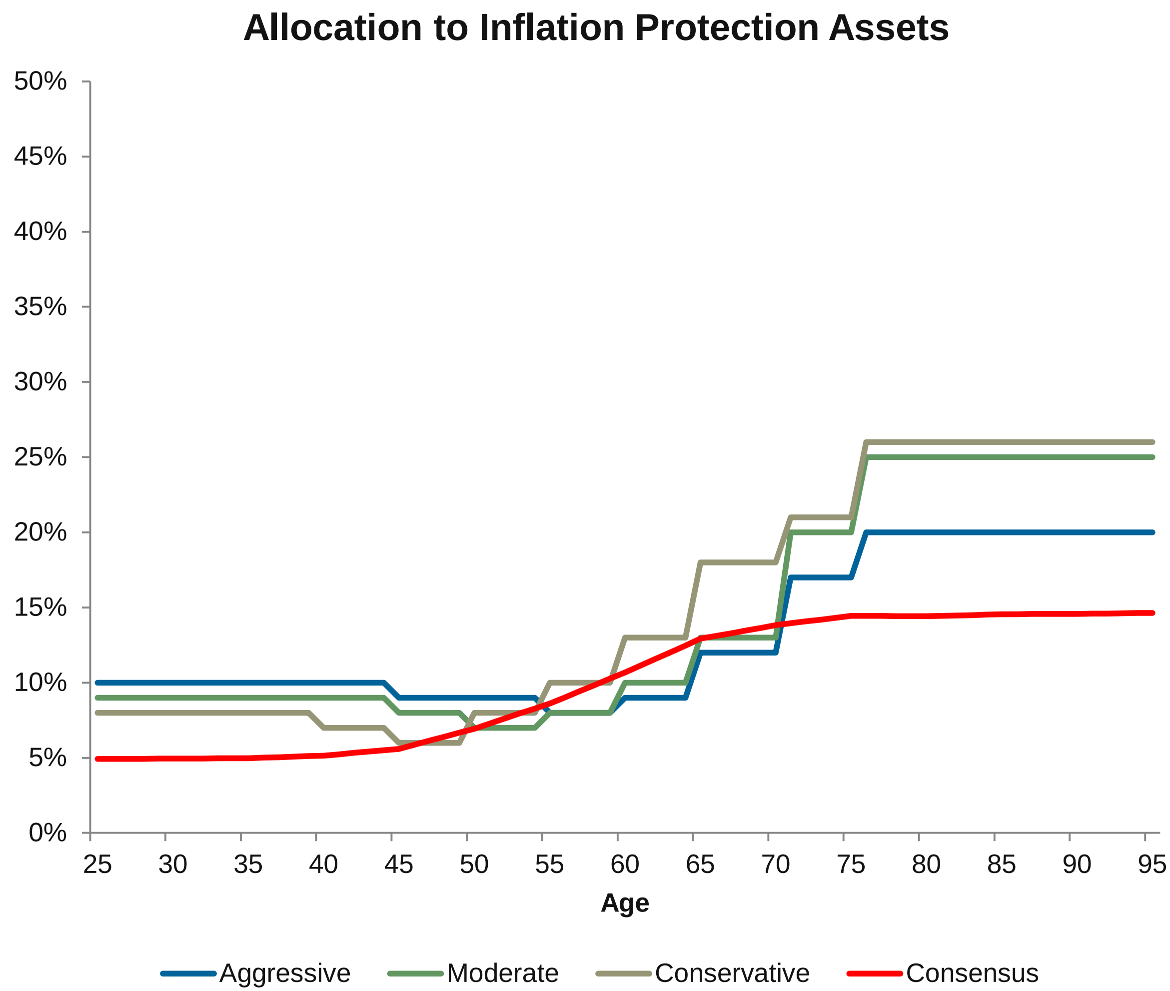


*The Callan Consensus glide path is a market average glide path made up of roughly 70 providers' allocations. A more detailed look at downside protection assets is contained in Appendix III

Underlying Allocations

Inflation Protection Assets*

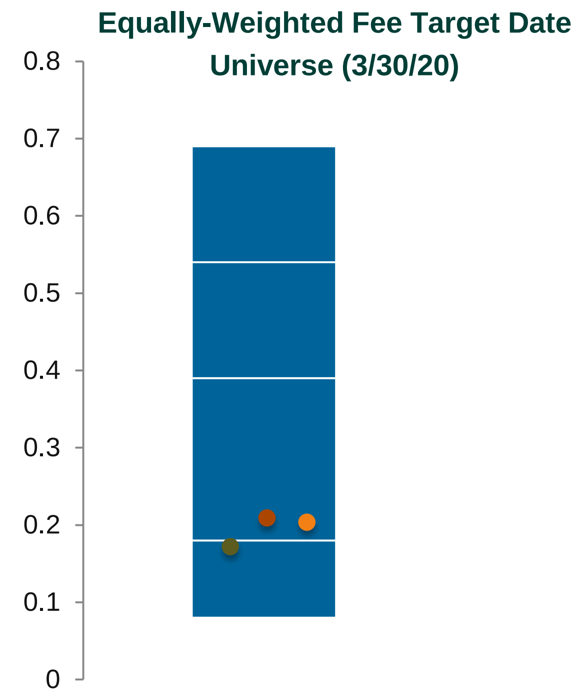
- The allocation to inflation protection assets is composed of those asset classes that could be expected to respond to changes in inflation rates. These include TIPS, commodities and REITs.
- It is reasonable to expect other asset classes such as equities to keep pace with inflation, albeit over longer time periods.
- The GoalMaker portfolios include allocations to TIPS as well as the North Carolina Inflation Responsive Fund, which includes underlying allocations to TIPS, REITs and commodities.
- The overall allocations are on par with the Callan Consensus, and well above that of the Consensus in the later retirement years.



*The Callan Consensus glide path is a market average glide path made up of roughly 70 providers' allocations. A more detailed look at inflation sensitive assets is contained in Appendix III

Fees

- The fee for the various portfolios is made up of a weighted average of the underlying building block allocations. The underlying share of passive management within the glide path ranges from 24% to 44%, making the series predominantly active in its implementation.
- There is no explicit fee for the service, rather it is included in the base recordkeeping fee paid to Prudential.
- All of the paths are below the median relative to target date funds.
- Due to the low cost on the passive large-cap component, the average fee for the aggressive path is the lowest of the three paths.

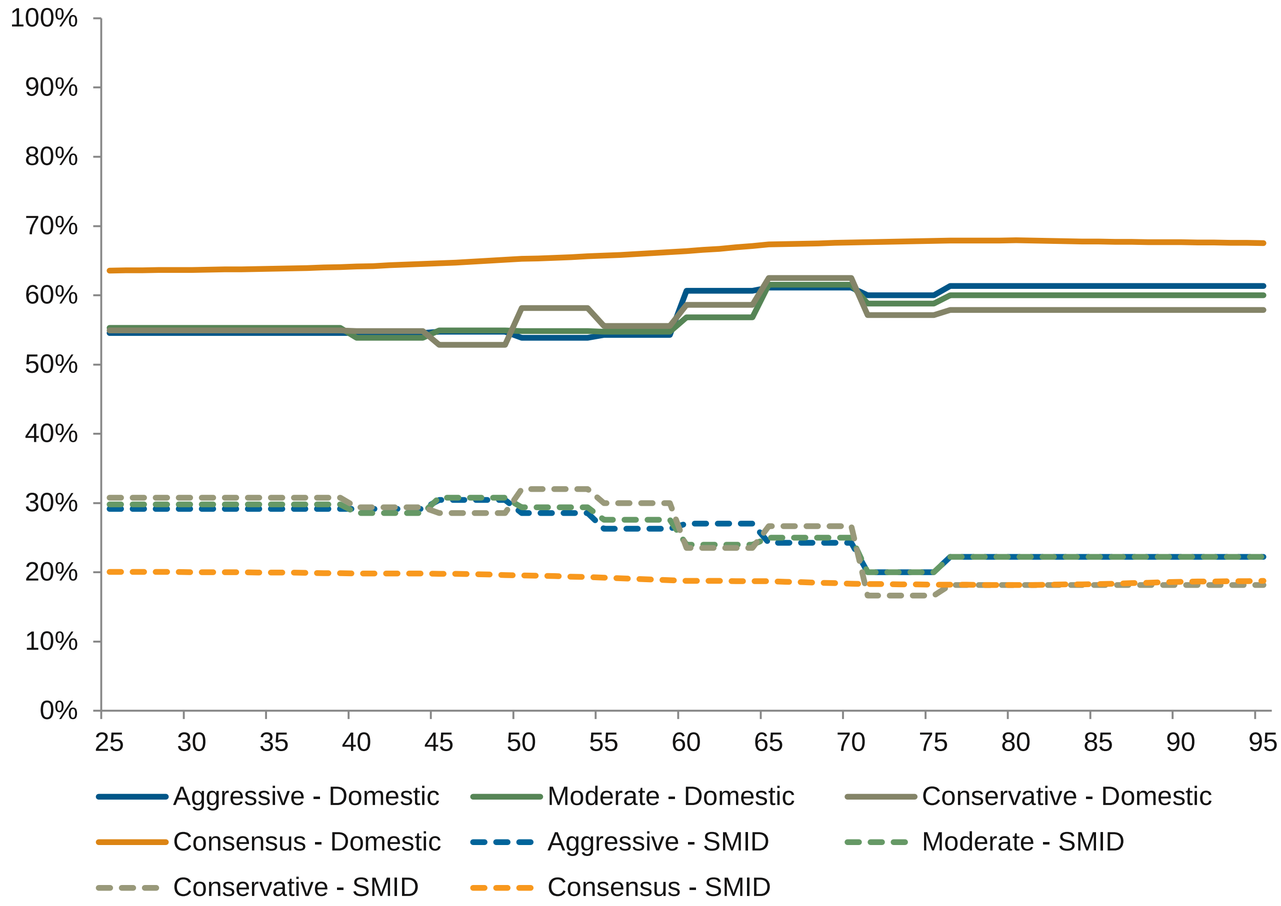


90th	0.69
75th	0.54
50th	**0.39**
25th	0.18
10th	0.08
Aggressive	0.17
Moderate	0.22
Conservative	0.21

Asset Allocation

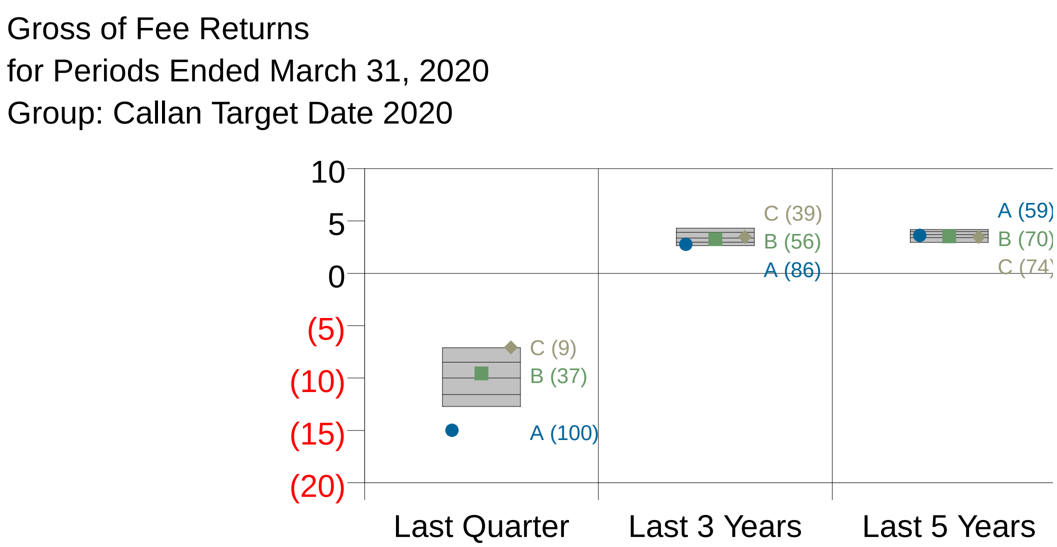
- Within **total equity** the share of domestic equity ("domestic") is lower in the GoalMaker portfolios relative to the Callan Consensus. This implies a lower home-country bias in the GoalMaker portfolios whose equity allocation in terms of US/non-US are closer to global capital weightings (52/48 US/non-US).
- In terms of the weighting of small/mid-cap equity (relative to **total domestic equity**) the GoalMaker portfolios generally have a higher allocation to small/mid-cap equity relative to the Callan Consensus.

Share of Small and Domestic Equity



Performance

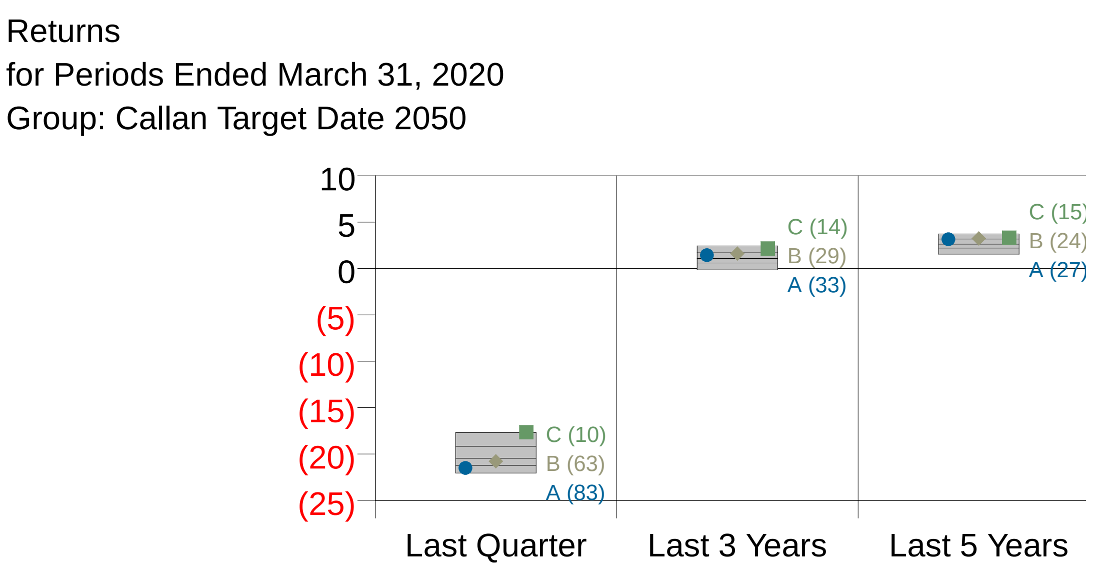
Age 62.5 to 67.5 Allocation



- The GoalMaker portfolio composite performed as expected given the underlying building blocks and allocations.
- The dispersion in performance, especially during the last quarter shows the impact that differences in asset allocation have on results.
  - Those in the Aggressive version saw more than double the loss as those in the Conservative version.
  - Those in the Aggressive version though have outperformed the other two flavors over the longer (8 year) period.

Performance

Age 32.5 to 37.5 Allocation



- At the far-dated side (more time to retirement), the aggressive and moderate paths outperformed the median peer over the time periods of 3 years or longer.

Risk-Adjusted Performance

Sharpe Ratios

	5 Year	8 Year
2050 Aggressive	0.13	0.43
2050 Moderate	0.14	0.44
2050 Conservative	0.17	0.49
2050 Median Peer	**0.11**	**0.43**
2020 Aggressive	0.20	0.54
2020 Moderate	0.29	0.65
2020 Conservative	0.35	0.73
2020 Median Peer	**0.28**	**0.65**

- The Sharpe ratio adjusts performance by factoring in volatility.
- On a risk-adjusted basis the various paths largely outperformed the median peer. This reflects not only the underlying asset classes (over these periods fixed income performed well relative to equity in risk-adjusted terms) but also the strength of the underlying active managers that make up the building blocks.

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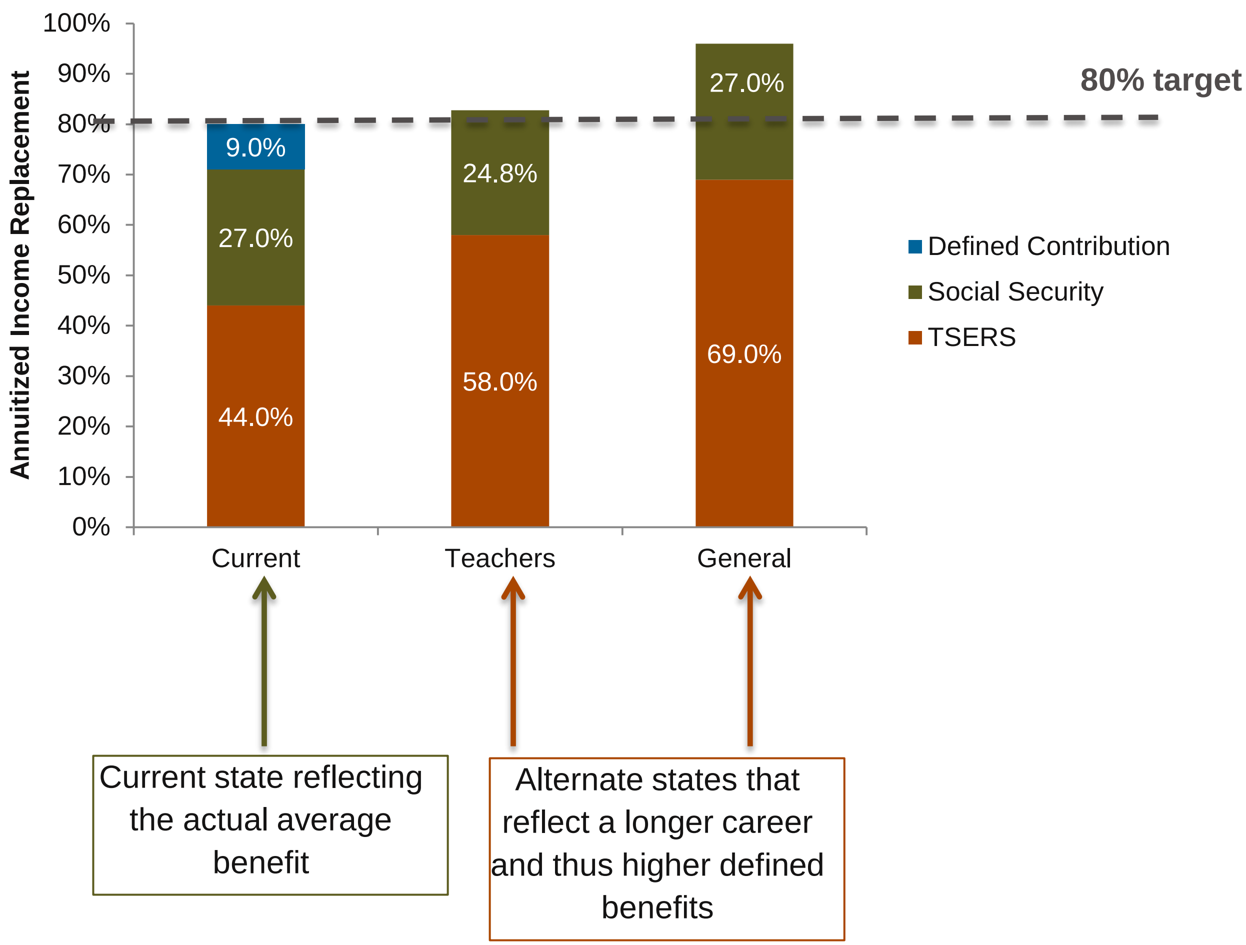
Forward Looking Analysis

Setting the Goal Posts

- For those in the various North Carolina defined contribution plans, the benefits from the DC plans are truly a supplement.
- In the current state (according to the current actuarial report), those receiving benefits (teachers and the general population) from TSERS are, on average, funding 44% of income replacement from the defined benefit plan*.
- This benefit plus Social Security leaves **9% of required replacement from the defined contribution system.**
- If we model longer tenure that reflects an age 65 retirement (40 years for general, 33 years for teachers) the defined contribution plan is purely a supplement: meaning the target replacement goal is met through the TSERS benefit along with Social Security.
- Generally we target 85% income replacement, however in this case, we use a target of 80% as participants have access to post-retirement healthcare.

Components of Retirement Funding



*2018 TSERS Evaluation

Projection Analysis*

Decision Variables: Evaluating the Efficacy of a Glide Path

Wealth Accumulation
(Shortfall Risk)

- Expected long-term replacement ratio
- Probability of meeting replacement ratio target
- Exposure to growth assets

Downside Risk
(Short-Term Volatility)

- Worst-case annual return (2 standard deviation event)
- Dollar-weighted risk
- Multi-year drawdown
- Roll-down rate
- Exposure to downside protection assets

Post Retirement
(Inflation Risk and Longevity Risk)

- Probability of outliving assets
- Asset-life expectancy
- Dollar-weighted risk
- Multi-year drawdown
- Breadth and level of inflation sensitive asset exposure

*Refer to appendix for complete assumptions used in forward-looking simulations

Shortfall Risk

Risk of not accumulating enough assets to retire

401(k) Plan Projections		Median Replacement Ratio (age 65)	Worst Case Replacement Ratio* (age 65)	Average Exposure to Growth Assets* (25–65)	Growth Assets at Age 64
GoalMaker - A	General/Base	37%	12%	80.0%	61.0%
	Teachers	33%	11%		
GoalMaker - M	General/Base	32%	12%	69.6%	44.0%
	Teachers	30%	11%		
GoalMaker - C	General/Base	27%	12%	53.8%	29.0%
	Teachers	25%	11%		
Consensus	General/Base	32%	12%	78.8%	50.2%
	Teachers	30%	11%		

- From a forward looking perspective, the various paths all perform in-line with what one would expect from the underlying asset allocation.
- The ‘moderate’ path projects outcomes similar to that of the Consensus glide path.
- In all cases, the baseline target of 9% income replacement is met.

*For a complete definition please see Appendix IV: Glossary.

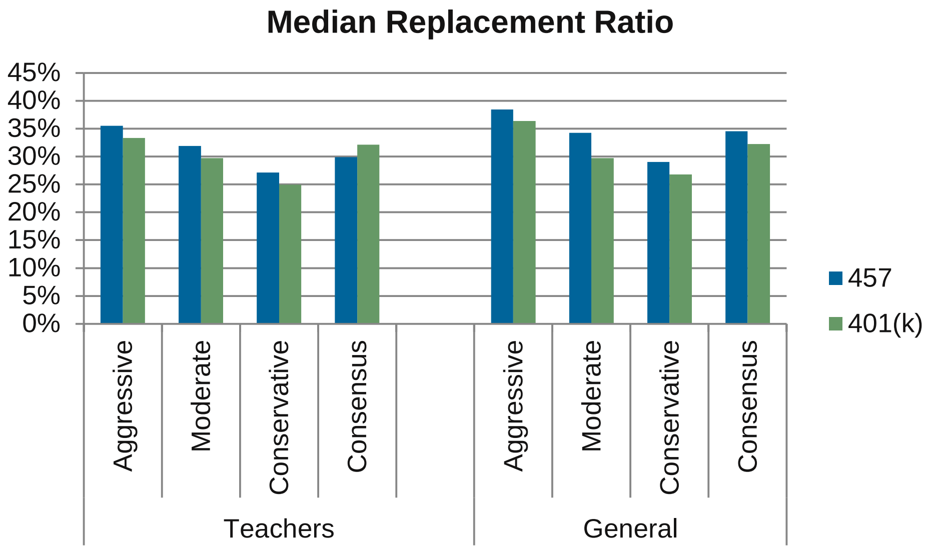
“Worst Case” is defined as the 97.5th percentile worst case drawdown from age 50–65. “Expected” is the median result.

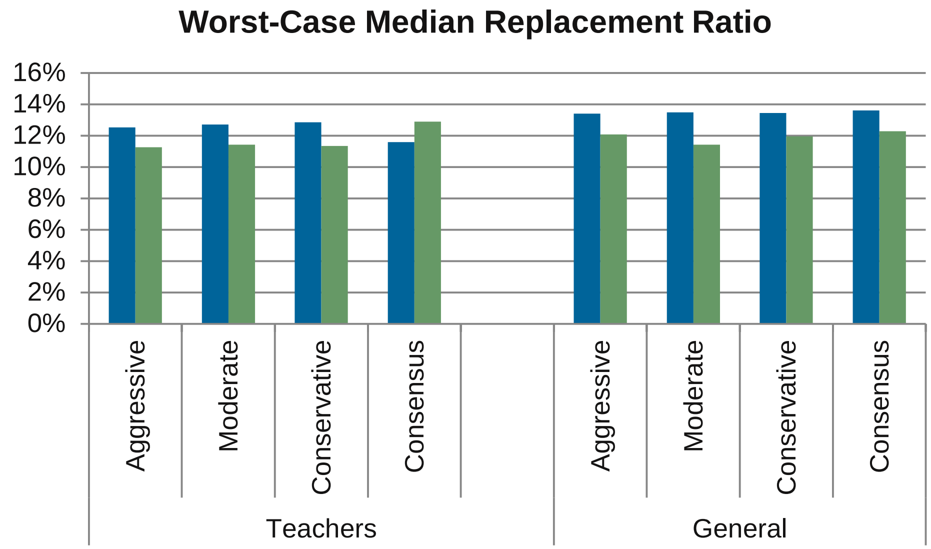
glidepath allocations reflect strategic glidepath weights.

Shortfall Risk

Total Replacement Ratios

In addition to the 401(k) plan, there access to a 457 plan. The tables below illustrate the median and worst-case replacement ratios for the 401(k) as well as the 457 plan:



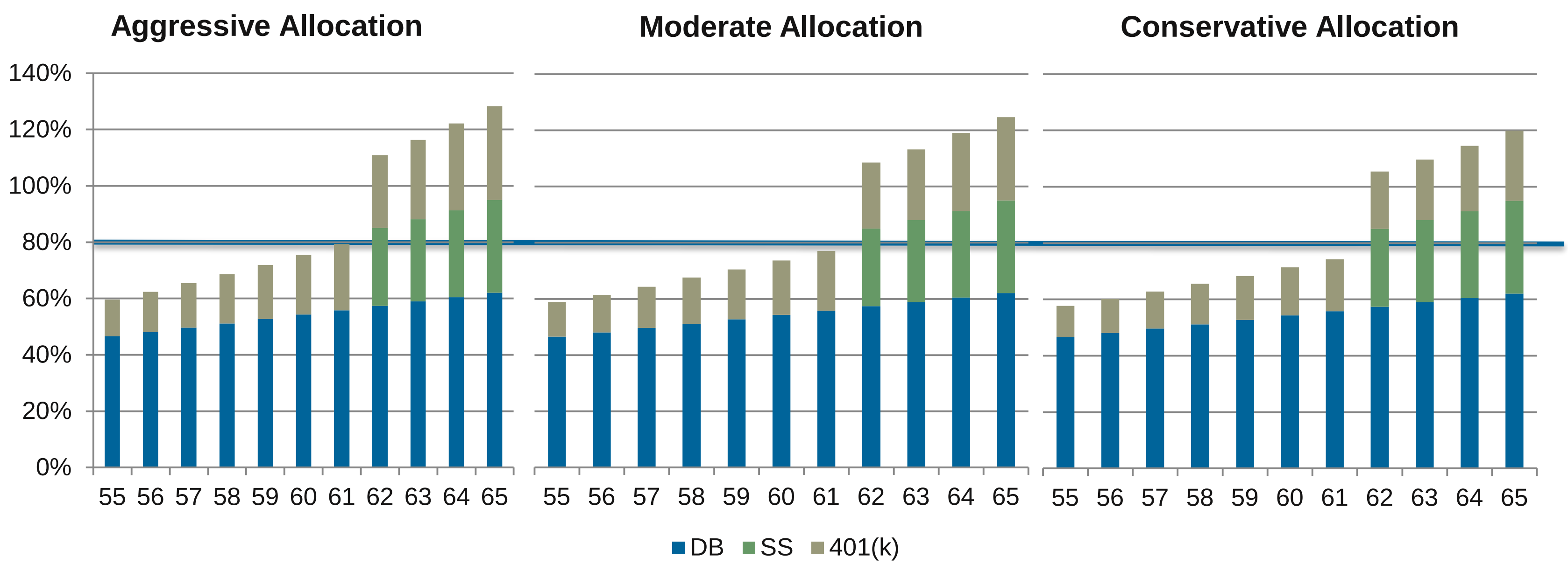


- When looking at both the 401(k) and the 457 plan, both the median and the worst-case replacement ratios meet the baseline target of 9% income replacement.
- As the plan is a supplement to the other benefit, the various risk-based GoalMaker paths are allowing participants to top-off their other benefits.

Shortfall Risk

Summing the Pieces – Teachers – 401(k)

We can also examine how shortfall risk looks for those retiring at different ages:

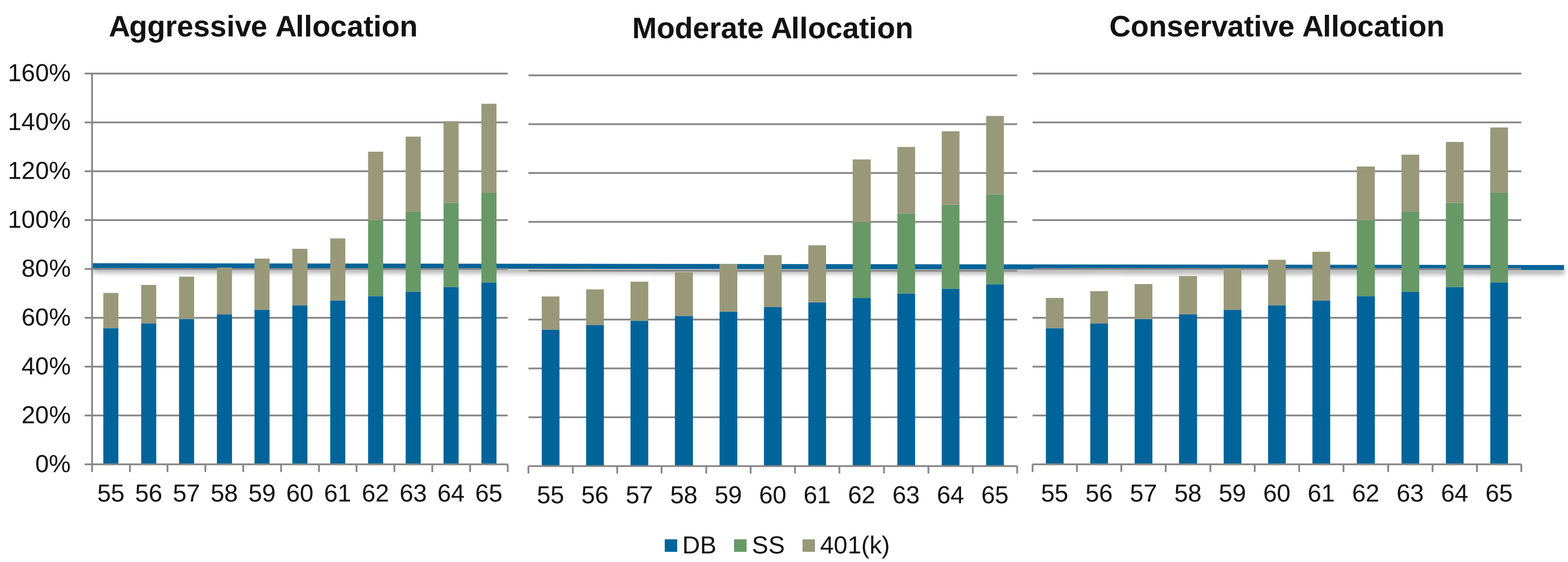


- A potential retiree can start Social Security retirement benefits as early as age 62, but the benefit amount received will be less than the full retirement benefit amount (full benefits begin at age 66).
- Although participants may retire when they max out their service time (30 years) they may take on other forms of employment to supplement income ahead of taking Social Security.

Shortfall Risk

Summing the Pieces – General Population – 401(k)*

We can also examine how shortfall risk looks for those retiring at different ages:



- A potential retiree can start Social Security retirement benefits as early as age 62, but the benefit amount received will be less than the full retirement benefit amount (full benefits begin at age 66).
- Although participants may retire when they max out their service time (30 years) they may take on other forms of employment to supplement income ahead of taking Social Security.

Details on the 457 are given in Appendix VIII

Downside Risk

Risk of volatility, particularly in the pre-retirement period

	Number of Downside Protection Assets**	Age 50 to 65			
		Roll Down Rate*	Average % of Downside Protection Assets**	Expected Standard Deviation	Worst Case Multi-Year Return
GoalMaker – A	3	1.6%	24.2%	13%	-41%
GoalMaker - M	3	1.5%	42.0%	10%	-30%
GolaMaker - C	3	1.3%	60.8%	7%	-17%
Consensus	3	1.9%	36.0%	10%	-32%

- The various flavors of the GoalMaker paths provide downside protection in line with their asset allocation.
- Most assets reside in the Moderate path which closely mirrors the risk metrics of the Callan Consensus glide path.

*Rolldown Rate measures the annual decrease of growth assets from age 50 to age 65.

**For a complete definition please see Appendix III: glidepath asset classes.

“Worst Case” is defined as the 97.5th percentile worst case drawdown from age 50–65. “Expected” is the median result.

Glide path allocations reflect strategic glidepath weights.

Inflation Risk

Risk of inflation adversely affecting outcomes

	Average Inflation Assets (65–85)	% of Inflation Protection Assets at Age 60	% of Inflation Protection Assets at Age 65	Number of Inflation Protection Assets
GoalMaker – A	17%	9%	12%	3
GoalMaker - M	20%	10%	13%	3
GolaMaker - C	22%	13%	18%	3
Consensus	14%	11%	13%	2*

- Inflation responsiveness is a function not only of the glidepath's exposure to inflation sensitive assets but also of the breadth of this exposure. Various asset classes respond to different types of inflation at different times.
- The GoalMaker portfolios provide allocations to TIPS, REITs and commodities. The level across all the various flavors provides exposure to inflation sensitive assets on-par with the Callan Consensus.

Glide path allocations reflect strategic glide path weights.

*Represents the average across the universe.

Longevity Risk

Risk of assets being depleted in retirement

	Growth Assets (Average 65–85)	Worst Case* Multi-Year Return (65–75)	Worst Case Multi-Year Return at Age 75+
GoalMaker – A	48.5%	-24%	-25%
GolaMaker – M	33.7%	-15%	-16%
GoalMaker – C	21.0%	-8%	-8%
Consensus	41.7%	-16%	-17%

- There is a balance between generating returns in retirement and avoiding potential losses. A glide path should provide adequate exposure to growth assets to hedge longevity risk, while at the same time controlling for volatility.
- The three paths de-risk to the point where the moderate flavor provides an allocation to growth assets well below that of the Callan Consensus. The aggressive path provides a higher upside though more potential volatility relative to the Consensus.

"Worst Case" is defined as the 97.5th percentile. "Expected" is the median result. Glide path allocations reflect strategic glidepath weights.

Summary

DOL Tip	Completed	Notes
Establish a process for comparing, selecting, and periodically reviewing target date funds.	✓	The incumbent solution is reviewed on a quarterly basis. This document represents a periodic deep dive to review its overall suitability.
Understand the funds' investments and how these will change over time.	✓	The funds provide ample diversification at the asset class level.
Develop effective associate communications .	✓	The funds' communication materials and fact sheets are consistent with industry best practice.
Review the funds' fees and investment expenses.	✓	The investment management fees across the product suite remain reasonable compared to peers and are driven entirely by the underlying building blocks.
Inquire about whether a custom or non-proprietary target date fund series would be a better fit for your plan.	✓	The existing solution is in a sense, a quasi-custom solution. They utilize non-proprietary building blocks.
Take advantage of available sources of information to evaluate the TDF and recommendations you received.	✓	This document draws from various sources of information, including from both third parties as well as directly from managers.
Document the process.	✓	This document along with the quarterly review provides documentation of the process.

Conclusion

Based on the data examined, Callan has the following conclusions regarding the suitability of the GoalMaker Allocations:

- The GoalMaker funds allow North Carolina to leverage the strength and scale of the underlying core funds.
- They provide the means for participants to access professional asset allocation with a reasonable all-in-fee.
- The projected outcomes show participants topping off their other existing benefits (defined benefit + Social Security) as expected from a supplemental plan.
- The portfolios have performed as expected given their asset allocation.

Several considerations though should be noted:

- The existing methodology to select one of the three paths does not consider the presence or level of ancillary benefits. The construction of the paths did take these benefits into consideration.
- The methodology has an abrupt rebalancing methodology.
- The solution is proprietary to Prudential as a recordkeeper. If the Plans were to ever move away from Prudential, the solution would no longer be viable.

Appendix

Appendix I

2020 Capital Market Projections

Asset Class	Index	PROJECTED RETURN 1-Year Arithmetic	 10-Year Geometric*	 Real	PROJECTED RISK Standard Deviation	Projected Yield
Equities						
Broad U.S. Equity	Russell 3000	8.55%	7.15%	4.90%	18.10%	2.00%
Large Cap U.S. Equity	S&P 500	8.35%	7.00%	4.75%	17.70%	2.10%
Small Cap U.S. Equity	Russell 2500	9.25%	7.25%	5.00%	21.20%	1.55%
Global ex-U.S. Equity	MSCI ACWI ex USA	9.10%	7.25%	5.00%	20.50%	3.10%
Developed ex-U.S. Equity	MSCI World ex USA	8.70%	7.00%	4.75%	19.70%	3.25%
Emerging Market Equity	MSCI Emerging Markets	10.25%	7.25%	5.00%	25.70%	2.65%
Fixed Income						
Short Duration Gov't/Credit	Bloomberg Barclays 1-3 Yr G/C	2.70%	2.70%	0.45%	2.10%	2.85%
Core U.S. Fixed	Bloomberg Barclays Aggregate	2.80%	2.75%	0.50%	3.75%	3.40%
Long Government	Bloomberg Barclays Long Gov	2.55%	1.80%	-0.45%	12.50%	3.40%
Long Credit	Bloomberg Barclays Long Cred	3.75%	3.25%	1.00%	10.50%	5.05%
Long Government/Credit	Bloomberg Barclays Long G/C	3.25%	2.75%	0.50%	10.60%	4.45%
TIPS	Bloomberg Barclays TIPS	2.50%	2.40%	0.15%	5.05%	3.15%
High Yield	Bloomberg Barclays High Yield	5.10%	4.65%	2.40%	10.25%	7.30%
Global ex-U.S. Fixed	Bloomberg Barclays Glbl Agg xUSD	1.30%	0.90%	-1.35%	9.20%	2.05%
Emerging Market Sovereign Debt	EMBI Global Diversified	4.70%	4.35%	2.10%	9.50%	6.70%
Other						
Core Real Estate	NCREIF ODCE	7.05%	6.25%	4.00%	14.00%	4.75%
Private Equity	Cambridge Private Equity	12.00%	8.50%	6.25%	27.80%	0.00%
Hedge Funds	Callan Hedge FOF Database	5.25%	5.00%	2.75%	8.70%	0.00%
Commodities	Bloomberg Commodity	4.50%	2.75%	0.50%	18.00%	2.25%
Cash Equivalents	90-day T-bill	2.25%	2.25%	0.00%	0.90%	2.25%
Inflation	CPI-U		2.25%		1.50%	

Source: Callan LLC

Appendix II

Modelling Assumptions

- The study used the following contribution rates (underlying data came via the Plan's recordkeeper) for the total population:

- Salary for teachers and the general population grows consistent with assumptions from the TSERS actuarial report. For teachers this is 6.80% initially and falls to 2.75%. For the general population salary grows 4.75% initially and tapers off to 2.75%

	401(k)	457
25-30	4.0%	3.9%
30-35	4.2%	3.9%
35-40	4.5%	4.8%
40-45	4.8%	4.9%
45-50	5.1%	5.4%
50-55	5.8%	6.0%
55-60	6.3%	7.2%
60-65	7.3%	12.1%
General	Starting Salary	$38,000
	Percent Male	30%
	Starting Age	25
Teachers	Starting Salary	$38,000
	Percent Male	30%
	Starting Age	25

Appendix III

Callan glidepath Asset Classes

Growth Assets	Downside Protection	Inflation Protection
– U.S. Large Cap Equity	– U.S. Fixed	– TIPS
– U.S. Small/Mid Cap Equity	– Non-U.S. Fixed	– Commodities
– Non-U.S. Equity	– Hedge Funds	– REITs
– Emerging Markets Equity	– Long Duration	– Private Real Estate
– High Yield	– Stable Value	
– REITs	– Short Duration (Bloomberg Barclays Gov 1-3 yr)	
– Private Real Estate	– Cash	

- Callan's glidepath model currently simulates 24 asset classes (above shows broad asset classes, actual simulations view things at the sub-asset class e.g., domestic vs. global REITs)
- Asset classes are categorized as Growth assets, Downside Protection assets or Inflation Protection assets.
  - REITs and Private Real Estate fall under two categories – they can play a dual role in the glidepath.

Appendix IV

Glossary

Callan Consensus glidepath Index – An equally weighted index of the universe of available TDF “series” or “families” (currently 43)—including both mutual funds and collective trusts. The funds’ glidepaths are mapped into 24 asset classes. The Callan Consensus glidepath Index is created as an equal-weighted average of all the provider glidepaths, and will change dynamically over time as provider glidepath evolve and/or the provider universe expands.

Callan glidepath Universe – The TDF peer group. Represents the same universe of TDF funds found in the Callan Consensus glidepath Index. This includes both “To” and “Through” funds. This is the peer group used throughout the report.

Risk Terms

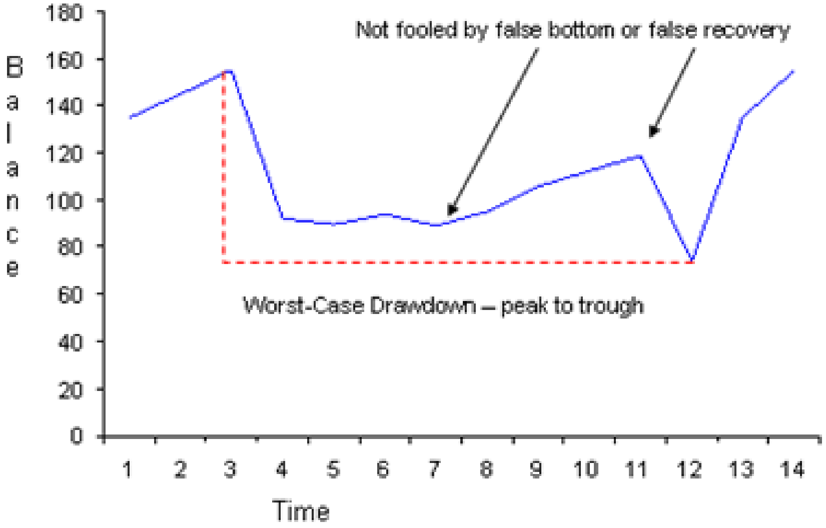
Dollar Weighted Risk – Dollar-weighted risk operates on the premise that volatility is more damaging in the later stages of an investor’s lifecycle, when balances are presumably higher. Essentially, the dollar-weighted risk statistic is evaluating volatility in relation to account balance. By projecting dollar-weighted risk, volatility at the beginning of a glidepath is penalized less than volatility later in the glidepath, when the investor has more to lose.

Downside Risk – The risk of short-term volatility and its possible impact on projected outcomes. To evaluate downside risk the construction of the glidepath near retirement is evaluated, in particular its exposure to downside protection assets, the breadth of this exposure and the steepness of rolldown of growth assets. Additionally various risk metrics are utilized including standard deviation, dollar weighted risk, point-in-time worst case return and peak-to-trough worst-case returns.

Appendix IV

Glossary (continued)

Worst-Case Multi-Year Return – As illustrated below, the worst-case multi-year returns is the peak-to-trough drawdown. The peak is the maximum value of the balance attained (time = 3). The trough is the minimum value the balance reaches (time = 12). Once the value decreases, this scenario is not "reset" until the account balance rises above its previous peak (time = 14). The maximum drawdown is then calculated as the percent change in the account value from its peak to trough.



Inflation Risk evaluates how a target date suite is positioned to respond to a high inflationary regime. Criteria examined are the breadth and exposure to inflation sensitive asset classes.

Longevity Risk is the risk of outliving one's assets. To evaluate longevity risk, traditional downside risk metrics such as standard deviation and worst-case returns during retirement are utilized. In addition the probability of outliving one's assets given the target spending rate is also evaluated.

Shortfall Risk – The risk of not accumulating enough assets in the period leading up to retirement. This metric looks at a variety of factors including the expected return, the probability of exceeding the target replacement ratio as well as accumulation metrics such as expected assets/final salary and expected assets/total cumulative contributions (TCC) expect replacement ratio.

Appendix V

Simulation Disclaimer

Callan’s TDVantage analytics project a range of wealth accumulation and risk outcomes for target date fund glidepaths over various capital market scenarios and time periods. Callan utilizes a proprietary Monte Carlo simulation model and proprietary capital market assumptions for return, risk and correlations to generate these analytics. The simulations require assumptions relating to the underlying demographics of the North Carolina plans.

For purposes of determining income replacement ratios, annuities are based on simulated 30-year Treasury Yields and RP-2014 with fully generational mortality improvement (MP-2014). The annuity is payable for a single life only and provides contractual indexing of 2.25% per annum.

No participant loans are reflected in the projections. Any applicable taxes are not reflected in asset projections or upon spending of assets. Thus, investment earnings accrue tax-free and spending is expressed pre tax. IRS tax deductibility contribution limits are not applicable due to the assumptions employed (i.e., simulated annual contributions are always less than $19,000 with median 2.25% inflation going forward). Finally, a 10% federal premature withdrawal penalty is not applied to withdrawals before age 59 1/2.

Callan projects capital markets and various metrics over an 80-year horizon (age 25 to age 105) across 1,000 economic scenarios. Capital market forecasting is based on Callan’s proprietary 10-year forward-looking expectations (2020–2029) and very long-term capital market expectations. The 10-year capital market outlook gradually blends into the long-term capital market outlook from year 11 to year 19.

Wealth accumulation and risk metrics shown in this document and reflect the assumptions outlined above.

Appendix VI: Target Date Funds – Custom?

Strengths and Weaknesses of Various Approaches of Approaches

	Off-the-Shelf	Custom
Customized to Demographics	√	+√
Ability to Exercise Control Over glidepath	-	+√
Ability to Change Underlying Funds	-	+√
Ability to Leverage Core Funds	-	+√
Product Availability	+√	+√
Ease of Rebalancing	+√	√
Ease of Matching with glidepath with Demographics	√	+√
QDIA Appropriateness	+√	+√
Ease of Communication	+√	√
Ease of Implementation	+√	-

Strongly addresses	+√
Moderately addresses	√
Does not address	-

Given the underlying population and the current resource constraints, Callan does not recommend pursuing a custom target date solution at this time. More likely than not, one of the 65 off-the-shelf glidepaths would prove suitable for the Plan.

Appendix VII

Proprietary Funds and Communications

The DOL also advises plan sponsors to:

- Inquire about whether a custom or non-proprietary target date fund would be a better fit for your plan
- Develop effective employee communications

- The funds' communication materials and fact sheets are consistent with industry best practice.

Appendix VIII – 457 Benefits Over Time

Teachers	DB	SS	457			Total		
			Aggressive	Moderate	Conservative	Aggressive	Moderate	Conservative
55	46.5%	0.0%	13.2%	12.5%	11.3%	59.7%	59.0%	57.9%
56	48.1%	0.0%	14.6%	13.6%	12.3%	62.6%	61.7%	60.4%
57	49.6%	0.0%	16.1%	14.9%	13.5%	65.7%	64.6%	63.1%
58	51.2%	0.0%	17.8%	16.7%	14.7%	69.0%	67.9%	65.8%
59	52.7%	0.0%	19.5%	18.0%	16.0%	72.2%	70.8%	68.7%
60	54.3%	0.0%	21.7%	19.9%	17.6%	76.0%	74.2%	71.9%
61	55.8%	0.0%	24.3%	22.0%	19.2%	**80.1%**	77.9%	75.0%
62	57.4%	27.6%	27.1%	24.7%	21.5%	**112.1%**	**109.7%**	**106.5%**
63	58.9%	29.2%	29.5%	26.4%	22.9%	**117.7%**	**114.6%**	**111.1%**
64	60.5%	30.8%	32.8%	29.4%	25.0%	**124.2%**	**120.8%**	**116.3%**
65	62.0%	33.0%	35.5%	31.9%	27.2%	**130.5%**	**126.9%**	**122.2%**

General	DB	SS	457			Total		
			Aggressive	Moderate	Conservative	Aggressive	Moderate	Conservative
55	55.8%	0.0%	14.5%	12.5%	12.4%	70.4%	69.5%	68.2%
56	57.7%	0.0%	15.8%	13.6%	13.3%	73.5%	72.5%	71.0%
57	59.6%	0.0%	17.6%	14.9%	14.5%	77.1%	75.8%	74.1%
58	61.4%	0.0%	19.4%	16.7%	15.9%	**80.9%**	79.6%	77.3%
59	63.3%	0.0%	21.4%	18.0%	17.3%	**84.6%**	**83.0%**	**80.6%**
60	65.1%	0.0%	23.6%	19.9%	19.0%	**88.7%**	**86.7%**	**84.1%**
61	67.0%	0.0%	26.4%	22.0%	20.7%	**93.4%**	**90.9%**	**87.7%**
62	68.9%	31.0%	29.3%	24.7%	23.1%	**129.1%**	**126.5%**	**123.0%**
63	70.7%	32.7%	32.0%	26.4%	24.6%	**135.5%**	**132.0%**	**128.1%**
64	72.6%	34.4%	35.3%	29.4%	26.7%	**142.4%**	**138.8%**	**133.7%**
65	74.4%	36.7%	38.4%	31.9%	29.0%	**149.6%**	**145.4%**	**140.2%**